ANNUAL DIRECTORY NUMBER

AVIATION

Public Library
RECEIVED MAR 23 1939

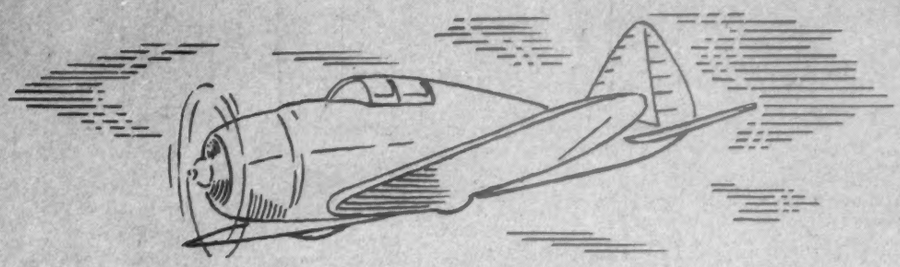
TWIN WASP ENGINES POWER THE NEW VULTEES

Here are the new and powerful Vultees...largest and fastest single-engine attack airplanes yet produced for the United States Army. Like many of the other new high-performance aircraft that will maintain U. S. leadership in the air, these fast and formidable Vultees are powered with dependable Pratt & Whitney engines.

PRATT & WHITNEY AIRCRAFT

One of the four divisions of

UNITED AIRCRAFT CORPORATION : EAST HARTFORD, CONNECTICUT



CONTINUOUS RESEARCH,
PIONEERING EXPERIMENTS,
AND UNENDING TESTS UNDER
ALL CONDITIONS HAVE
BROUGHT
SHELL AVIATION PRODUCTS
TO A PEAK OF PERFECTION.
THEIR
GREATEST RECOMMENDATION
IS THE MEN WHO PLACE
FULL DEPENDENCE UPON THEM.

SHELL
AVIATION PRODUCTS

CUB
makes and breaks
RECORDS

THE MAKING and breaking of records—production, sales, endurance flights, performance feats, mass air tours, etc.—seems to be a Cub habit. Scarcely a day passes without Cub scoring some new achievement. And this means much—not because Cub cherishes records for their glory but because the birth of each new star throws more light on the path of private flying:

★ Biggest mass flight (185 Cubs) ever held of a single type of commercial plane, to Miami, Florida in January, 1939. Over 350,000 aggregate miles.

★ Lightplane world endurance record: 218 hours, 23 minutes. Held by Tom Smith, Harley Long, and Clyde Schlieper flying "The Little Bear" over Lancaster, California. November, 1938.

★ Production and sales record: 111 during August, 1938. More than any company has produced and sold in any one month since the invention of the airplane in 1903.

★ Long distance non-stop lightplane refueling record: 2390 miles. Held by Kenneth Kress and Glenn Englert flying a Lenape Papoose Cub New York-Miami-New York. May 19, 1938.

★ First airplane to be used in a civilian training program by a state. Five bought by the Bureau of Aeronautics, Nashville, Tennessee, through its director, Major Walter M. Williams, for training fifteen selected civilians per year in each of five major cities.

★ For the past three years one-third of all aircraft sold commercially in the United States has been Cubs. Last year this proportion held, with the further distinction that of *lightplane* sales Cub accounted for one-half.

Free Flying Course

Cub dealers throughout the country are prepared to give every purchaser of a new Cub airplane a course of dual flying instruction in the purchaser's own plane, without charge. This free course is given by Government licensed instructors. Your Cub dealer will be glad to give you a free flight demonstration.

Free Catalog!

Send today for colorful, illustrated new 1939 Cub catalog, full details of the free flying course and name of your Cub dealer. Piper Aircraft Corporation, 29 A Street, Lock Haven, Pa., U.S.A. . . . Cub Aircraft Co., Ltd., Copenhagen, Denmark and Cub Aircraft Ltd., Hamilton, Canada.

★ Largest civilian mass flight ever held in Canada of one type of plane: First Annual Canadian Cub Tour. 51 Cubs to Hamilton and Toronto Sept., 1938.

★ First airplane to feature free flying course with each plane sold. 5,872 hours (worth $38,168 at the average rate of $6.50 per hour for dual instruction) since this offer was announced eleven months ago.

★ Cub factory is located in the "flyingest city in the world" where one out of every 90 inhabitants is a pilot in distinction to the national average of 1 out of every 3000.

★ Most active flying club in the world uses Cub. Factory employees' club, averaging 80 members from month to month, has logged over 7000 hours in three years. "Cub Fliers of Lock Haven."

★ More than 20,000 student pilots are taking their training in Cubs—and this number is increasing daily.

★ Cub manufactures the most complete line of light airplanes on the market . . . Cub Trainer $1249; Cub Sport (Continental 40 H.P. engine) $1395; Cub Sport (choice of 50 H.P. engines) from $1499; Cub Coupe (Continental 50 H.P. engine) $1995; Cub Seaplane from $1944; Cub Skiplane from $1299. All prices F.A.F. Lock Haven, Pa.

There's a Cub for Every Purse and Purpose - - - from $419 Down

COUNT THE CUBS THE WORLD'S FASTEST SELLING AIRPLANE

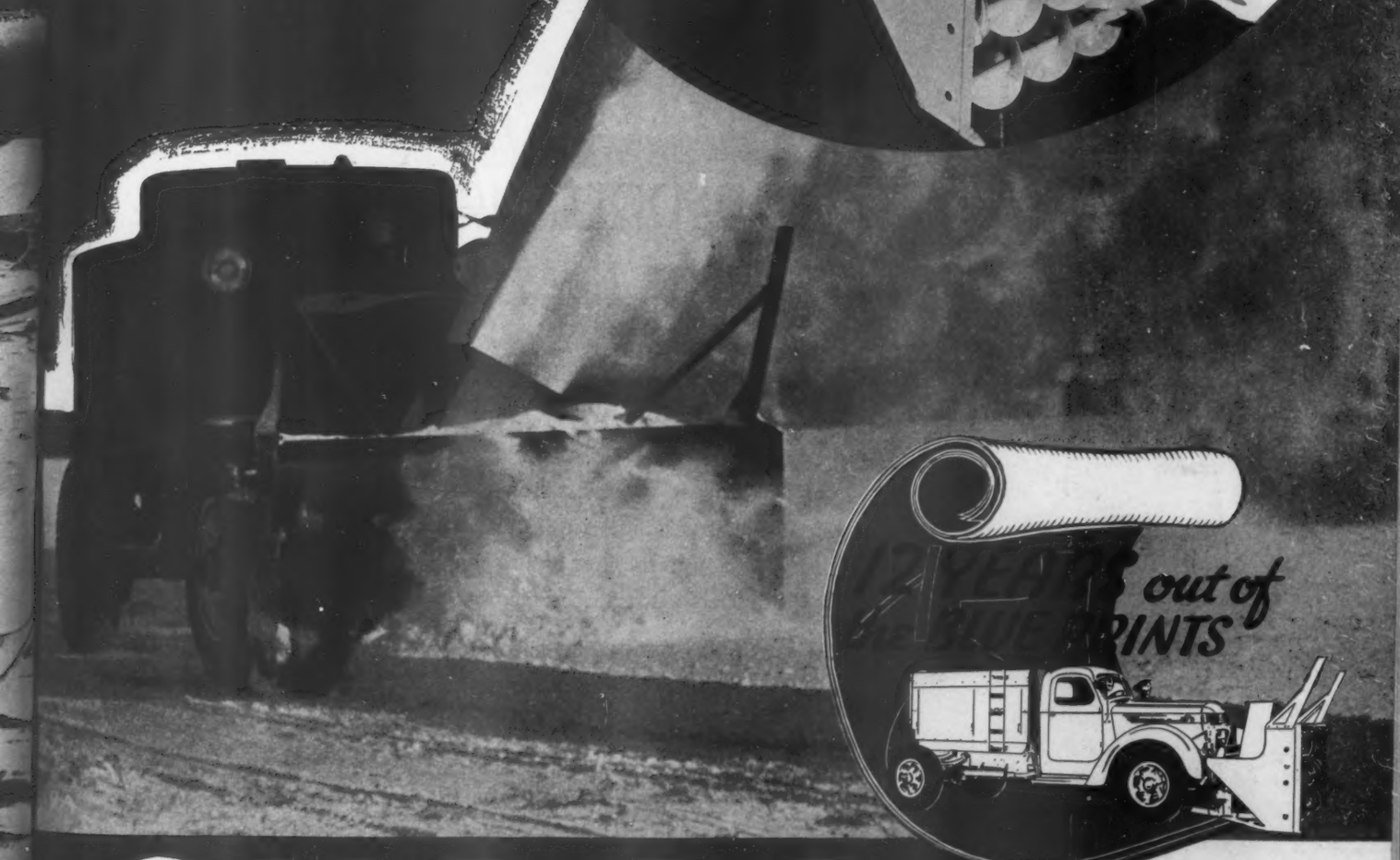
Published monthly, price 25c a copy. Subscription rates—United States, Canada, Mexico and Central American Countries, $3.00 a year. All other countries, $6.00 a year or 34 shillings. Entered as second-class matter, September 3, 1936, at the Post Office, Albany, N. Y., under the Act of March 3, 1879. Volume 38, Number 2.

United Airports
protect Rentschler Field
E. Hartford, Conn.
with SNOGO

JOB!

SNOGO Model LMU for Model D-50 Three Ton International Trucks

The Model LMU is a high speed maintenance machine designed for airport service. For heavier trucks there is the Model TU for mounting on your standard four wheel drive truck. Snogo is positively guaranteed to handle any snow condition that will occur on your field, throwing it in either direction up to 100 ft. from the runway.



SNOGO

FOR COMPLETE SNOW REMOVAL

When you purchase a snow removal unit you want a proved machine. The first Snogo went into service 12 years ago and was proved basically sound in principle. Each year, steady improvement has developed Snogo to a point where today it represents the highest type of Snow removal equipment.

Transportation's FINEST

...The Boeing Clipper

With the introduction of the 74-passenger BOEING Model 314 Flying Boat, Pan American Airways once again sets a new standard in air travel facilities.

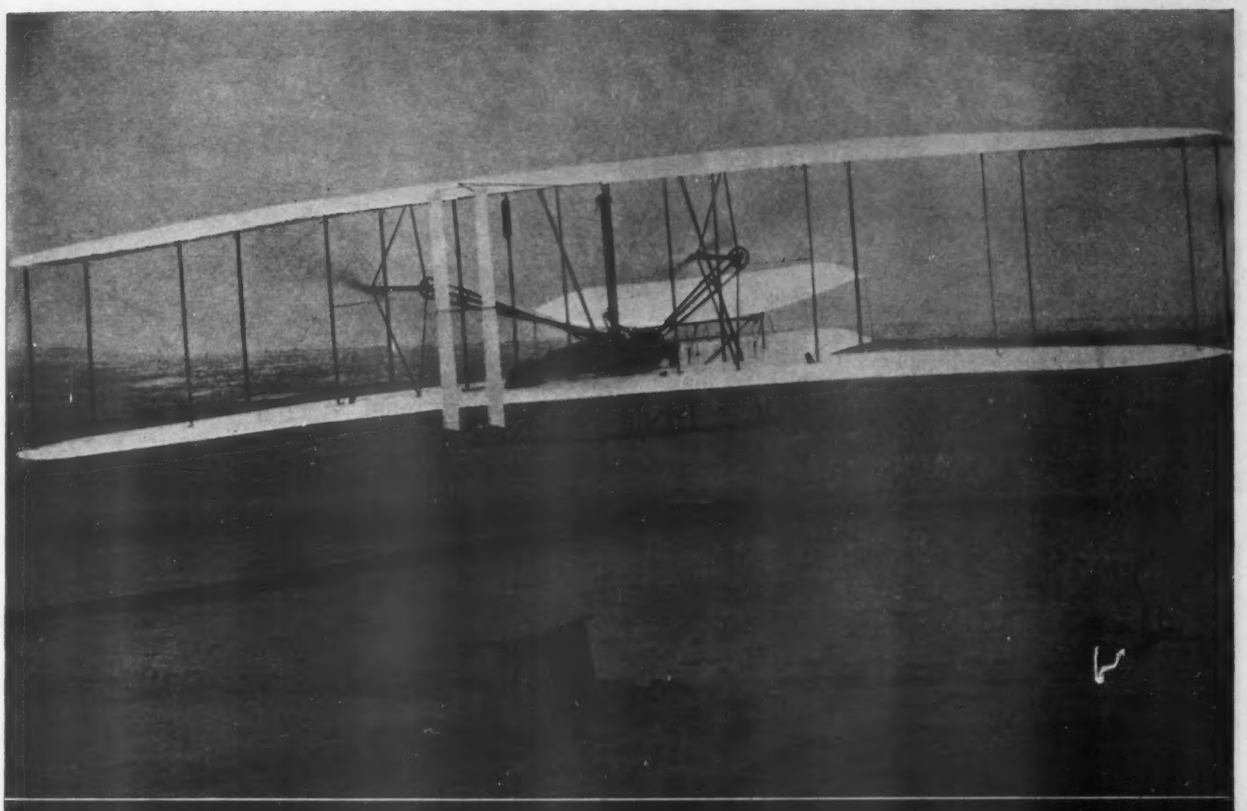
Largest and most luxurious air liners ever built for regular passenger service, these new Clippers are a fitting addition to the fleet of an air line renowned for its world leadership in transoceanic operations.

The BOEING AIRCRAFT COMPANY is proud to have contributed to this latest advance of the Pan American Airways System.

Pictured at left: Dining Saloon or Recreation Center • A Passenger Compartment • Writing Desk Corner in the Bridal Suite • Passenger Sleeping Accommodations.

BOEING

Boeing has always built tomorrow's airplanes today!



When Runways were greased rails

. . . New Departure developed the *first* triple-duty ball bearing

● When the Wright brothers were making their first powered flights, New Departure was busy pioneering new and better ball bearings. Today, not only in the important parts of the great airliners themselves, but in the finest of the precision machine tools used in building them, New Departure ball bearings are specified as original equipment.

There is no guesswork. Their quality, accuracy and absolute dependability are performance proved. When it comes to overhaul and replacement, there is nothing better than the original equipment—none more dependable than New Departure.

2751

New Departure Forged Steel ball bearings are made in the most modern and finest equipped bearing plant in the world. Over forty years' experience is behind every New Departure that goes into the air.

NEW DEPARTURE Ball Bearings

New Departure · Division General Motors Corporation · Bristol, Connecticut

NOTHING ROLLS LIKE A BALL

BUYING GUIDE

FOR WESTINGHOUSE ELECTRICAL EQUIPMENT

for the Aviation Industry

The list below, although not complete, indicates the thoroughness with which Westinghouse covers the electrical needs of the aviation industry. For every branch — from research and engineering to airport, airway, and factory equipment, Westinghouse provides a wider range of electrical products than any other manufacturer.

AIRCRAFT AND DIRIGIBLE EQUIPMENT

Westinghouse Micarta pulleys are used throughout the DC-4, and have been standard equipment on all types of aircraft for 15 years.

INSTRUMENTS; Voltmeters, Ammeters, Voltammeters, Specials.
DYNAMOTORS; for radio power.
FUEL VALVES; electrically operated.
GENERATORS AND CONTROL; main engine driven, auxiliary engine drive.
MICARTA PRODUCTS; Pulleys, Fairleads, Bushings, Instrument and Terminal Boards, Cabin Linings, etc.
MOTORS AND CONTROL; high speed, light weight.
LAMPS; for cabin and landing lights.
PANELBOARDS; Nofuze type.
RADIO; Receivers and Transmitters.
SENTINEL BREAKERS; for control of power circuits.

AIRPORT AND AIRWAY EQUIPMENT

Lighting

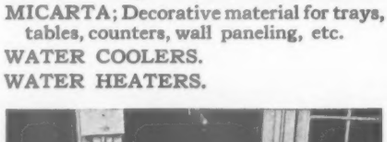
ALIDADES; for ceiling height measurement.
BEACONS; rotating, auxiliary and directional.
CEILING PROJECTORS.
CODE FLASHERS; Mercury tube or Silver contact.
FLOODLIGHTS; all types, for landing fields, hangars, loading areas, building exteriors, parking areas, driveways.
HOLLOWSPUN GRANITE COLUMNS; for supporting floodlights.
LAMPS; for Beacons and Floodlights.
LUMINAIRES AND REFLECTORS; for administration buildings and hangars.
MARKER CONES; Tip-over and standard types.
MARKER LIGHTS; for boundaries, approaches, towers, etc.
MARKER WINGS.
NEON OBSTRUCTION LIGHTS.
ON-COURSE LIGHTS.
RELAMPING DEVICES; for obstacle lights.
SEARCHLIGHTS; Signaling.
SODIUM VAPOR LAMPS.
TRAFFIC SIGNALS; portable and stationary.
WIND INDICATORS; cones and tees.

Control, Power and Distribution

CABLE; noninductive armored, lead encased, juted.
CIRCUIT BREAKERS; all types and ratings.
CONTROL DESKS; for centralized lighting control.
CONSTANT CURRENT REGULATORS, station, manhole or pole types.
MOTOR-GENERATORS AND DYNAMOTORS.
MOORING MAST EQUIPMENT; Motors, Electric Locomotives, and other electrical machinery.
PANELBOARDS; Nofuze type for control and protection of all circuits.
PHOTOLUX LIGHTING CONTROL RELAYS; for lighting equipment.
RADIO RANGE BEACON AND TRANSMITTER EQUIPMENT.
R-C-O-C REMOTE CONTROL SWITCHES, RELAYS.
TIME SWITCHES; automatically turn lighting equipment off or on at any desired hour.
TRANSFORMERS; all types, for lighting and power.

Administration and Service Buildings

AIR CONDITIONING, REFRIGERATING AND COOLING EQUIPMENT.
FANS; Ceiling, Bracket, Desk, Exhaust.
MICARTA; Decorative material for trays, tables, counters, wall paneling, etc.
WATER COOLERS.
WATER HEATERS.



Westinghouse control desks are being used in many of the newest and best equipped ports throughout the country.

Shop and Repair

ARC WELDERS; portable or stationary, single or multiple-operator, transformer and motor-generator.
BATTERY CHARGERS; motor-generators, rectifiers.
BATTERY TESTING INSTRUMENTS.
HEAT-TREATING FURNACES; all types for hardening, tempering, annealing, etc.
MELTING POTS; babbitt, solder, etc.
MOTORS; all types — for hangar doors, tools, gasoline and fire pumps, etc.
MOTOR CONTROLLERS; manual or automatic.
PANELBOARDS; Nofuze type.
SUBSTATION AND POWER EQUIPMENT.

Westinghouse

AIRCRAFT FACTORY AND REPAIR STATION EQUIPMENT

A modern aircraft factory, completely lighted by Westinghouse — and utilizing a wide range of Westinghouse electrical equipment, such as transformers, switchboards, motors and control.

ANODIC TREATING EQUIPMENT.

ARC WELDERS; portable or stationary, single or multiple-operator, transformer or motor-generator types.

BABBITTS AND SOLDERS.

BATTERY CHARGERS; motor-generators and rectifiers.

BATTERY-TESTING INSTRUMENTS.

CAPACITORS; for power-factor correction.

CIRCUIT BREAKERS; De-ion, carbon, oil types.

DIESEL - ELECTRIC LOCOMOTIVE EQUIPMENT.

FLUID VALVES; electrically-operated for handling liquid and compressed air mediums.

FUSES AND FUSE BLOCKS.

GEARS AND PINIONS; heat-treated or Micarta.

GEAR UNITS AND SPEED REDUCERS.

HEAT - TREATING FURNACES; for hardening, tempering, annealing, etc.

HEATERS, ELECTRIC; air heaters, immersion heaters.

INDUSTRIAL ANALYZERS, INSTRUMENTS AND METERS; all types for any service.

INSULATING MATERIALS; varnishes, tapes, compounds, cements, treated fabrics, and micas.

INSULATION TESTING EQUIPMENT.

LAMPS.

LIGHTING EQUIPMENT; Luminaires and reflectors.

MELTING POTS; babbitt, solder, etc.

MICARTA PRODUCTS; gears, panels, sheets, tubing, channels, angles, etc.

MOTORS; for shop tools, fire pumps, cranes, etc.

MOTOR CONTROLLERS; manual or automatic.

OIL PURIFIERS; centrifuge and filter press types.

PANELBOARDS; Nofuze type.

RESISTANCE WELDING; Ignitron Timer, Weld-o-trol.

SAFETY SWITCHES.

SOLDER and soldering compounds.

SUBSTATION and power plant equipment.

WATER COOLERS.

WATER HEATERS.

RESEARCH, SCHOOL AND LABORATORY EQUIPMENT

Scale model of Stratoliner in Wind Tunnel at University of Washington. Electrical equipment by Westinghouse.

DYNAMOMETERS.

DYNAMOTORS AND GENERATORS.

ELECTRONIC DEVICES.

HEAT-TREATING FURNACES; all types for hardening, tempering, annealing, etc.

INSTRUMENTS, ELECTRICAL PRECISION.

NOISE ANALYZERS, PORTABLE; for diagnosis of aircraft noises, soundproofing problems, etc.

OSCILLOGRAPHS.

RECTIFIERS.

RELAYS.

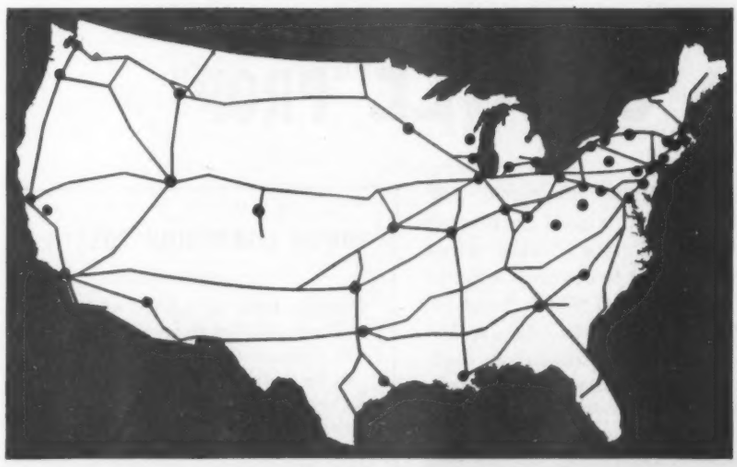
STROBOGLOW; for study of rapidly moving or vibrating machinery, propellers, etc.

TACHOMETERS.

TOWING CARRIAGE MOTORS AND CONTROL.

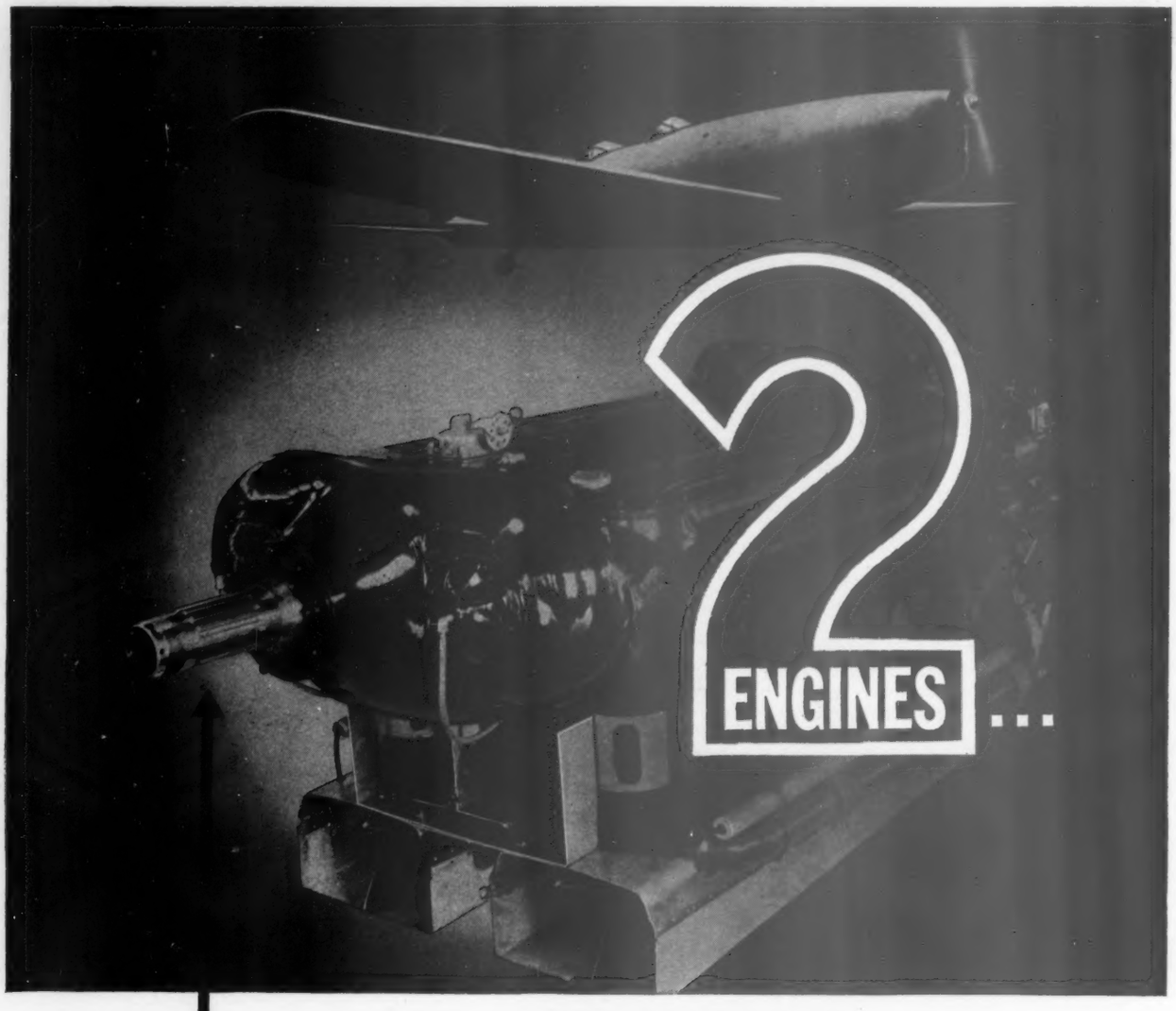
WIND TUNNEL MOTORS AND CONTROL.

WESTINGHOUSE SERVICE PARALLELS THE AIRWAYS



With sales offices in every principal city, with a chain of 37 well-equipped service shops, and with 27 warehouses well-stocked with standard apparatus and renewal parts, Westinghouse provides facilities within quick and easy access of every customer within the aviation industry. Whatever your electrical problem may be, expert engineering assistance, complete information, and prompt service is always available. Consult your local office, or write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Address Dept. 7-N. J-94005

Aviation Equipment



...WITH BUT A SINGLE "PROP"

TWO ENGINES spin the single "prop" in this new Vega plane. For safe, uninterrupted power, two Menasco motors drive through simple over-running clutches. With this Unitwin power plant, no synchronizing is needed. Operating singly, either engine provides ample power for climbing.

To withstand gruelling loads and shock stresses, Lockheed and Menasco engineers agreed that this new free wheeling propeller drive must be fabricated from SAE 2515 steel—the strong and tough 5% Nickel alloy steel.

For high fatigue resistance and high core strength with a hard wear resistant surface this Nickel alloy steel is carburized to develop a Rockwell (C) hardness of 60-62. Years of experience have proved that Nickel alloyed into metals induces each ounce, each inch of material to safely carry more load.

NICKEL

LOWER CORROSION LOSSES

•

Present tests by plane makers, airlines, and Government authorities indicate that corrosion losses can be reduced, upkeep expense lightened, by spotwelding skin-stressed wings and fuselages from specially processed stainless steels. This light gauge but extremely strong corrosion resistant material usually contains about 18% chromium and 8% Nickel. Complete information furnished upon request to:

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

AVIATION
THE OLDEST AMERICAN AERONAUTICAL MAGAZINE
Established 1916

FEBRUARY 1939 REGULAR EDITION

Contents for Vol. 38, No. 2

Flashes 13
From the Skyways of the World

Side Slips *By Robert R. Osborn* 17

Frontispiece 18
Aviation Training Abroad

Marching as to War *By S. Paul Johnston* 19
Student Training Programs here and abroad

Pilots and Planes of the U. S. 22
Statistics for Private Flying in 1938

Traffic Violators Beware 24
By Rear Admiral Percy Foote and William Wilson
"Aircraft at Work" for the Pennsylvania Motor Police

1939 Design Trends 26

- Interiors for Comfort 26
- For Happier Landings 28
- Props and Power Plants 30

American Planes and Engines for 1938 32
With Manufacturers Index and Personnel

Commercial Aircraft and Specifications 34

Military Aircraft and Specifications 50

Engines for 1939 54

AVIATION'S Engine Specification Tables 56

Accessories for 1939 60

- Engine Accessories and Instruments 60
- Aircraft Accessories and Instruments 62
- Radio for Safety 64
- Directory of Manufacturers of Accessories, Materials and Supplies 68

The Aviation News 79

- President Presents Arms Plans 80
- Aviation in Washington 82
- Curtiss-Wright Test's CW-21 "Interceptor" 84
- Aviation People 89
- As Others Fly It 93

Operators' Corner 96
Tagging the Bases with Les Neville

★

Louis F. Stoll
Vice-President

S. Paul Johnston
Editor

•

Leslie E. Neville
Managing Editor

Daniel Sayre
Associate Editor

Donald G. Fink
Radio Editor

Charles F. McReynolds
Pacific Coast

Paul Wooton
Chief of Washington Bureau

★

McGRAW-HILL PUBLISHING COMPANY, INC.
James H. McGraw, Founder and Honorary Chairman

Publication Offices: 99-129 North Broadway, Albany, N. Y.
Editorial and Executive Offices: 330 West 42nd Street, New York, N. Y.

Chicago, 520 North Michigan Ave. San Francisco, 883 Mission St. Los Angeles, 9121 Dalton Ave.
Aldwych House, Aldwych, London, W. C. 2
Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

JAMES H. McGRAW, JR., President
HOWARD EHRLICH, Executive Vice-President
MASON BRITTON, Vice-Chairman
B. R. PUTNAM, Treasurer
D. C. McGRAW, Secretary
J. E. BLACKBURN, JR., Circulation Manager

Published monthly, price 35c a copy. Subscription rates—United States, Canada, and Latin American republics, $3.00 a year. All other countries, $5.00 a year or 20 shillings. Entered as second-class matter, September 3, 1936, at the Post Office, Albany, N. Y., under the act of March 3, 1873. Printed in U. S. A. Cable address "McGrawhill, New York." Member of A.B.C. Copyright 1939 by McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York, N. Y. The following publications are combined with AVIATION: AERONAUTICAL ENGINEERING, AIRCRAFT JOURNAL and THE AVIATION NEWS. All rights to above names are reserved by the McGraw-Hill Publishing Company.

ALL LOCKHEED AIRPLANES ARE *Anodized*!*

Another maintenance economy by Lockheed!

ANODIC TREATMENT adds years to the corrosive resistance of magnesium alloy and aluminum airplane parts. Anodization of aluminum alloys is a strict requirement of the U. S. Army and Navy. So important is this process that Lockheed has expanded its anodization facilities to accommodate *all* assemblies on every class of Lockheed airplanes.

This is just *one* of many technical advances employed by Lockheed to increase the durability and efficiency of airline equipment and reduce operating and maintenance costs.

Such progressive advancement in both design and production is based on constant research into the problems of air transportation. It is evidenced in every phase of Lockheed construction and performance... from the economical accessibility of control units to the increased revenue miles per operating dollar.

Lockheed invites your inspection of its unsurpassed record of economical performance in the service of 28 airlines throughout the world. Compiled data applicable to the particular use of any Lockheed model will be furnished upon request.

* *Anodization is an electro-chemical oxidation of the surface of a metal which produces an oxide film highly resistant to corrosion.*

LOCKHEED AIRCRAFT CORPORATION

BURBANK • CALIFORNIA

REPRESENTATIVES THROUGHOUT THE WORLD

LOCKHEED

THE EMBLEM OF LEADERSHIP

Flashes

From the Skyways of the World

» No one could read through the 24th annual report of the National Advisory Committee for Aeronautics without sharing a justifiable pride in its achievement. At the same time anyone who is at all versed in research progress abroad knows that now is certainly no time to rest on our research laurels, for the race for air supremacy will not be won in the skies but is now being fought out in the research laboratories. Other nations of the world are crowding us closely for our hard-won technical superiority. In considering plans for an extended air defense program, we hope that the needs of the N.A.C.A. laboratories will be kept on the top of the list in full recognition of their indispensible place in the pattern of our national defense.

» And speaking of the N.A.C.A., congratulations to Lester Gardner's Institute of the Aeronautical Sciences for the election of Dr. George W. Lewis as its president for 1939. Dr. Lewis' contribution to the aeronautical sciences through the National Advisory Committee for Aeronautics is too well known to need repetition for readers of Aviation. It is certainly fitting and proper that the Director of Research of our greatest aeronautical laboratory should head up the activities of our Institute of the Aeronautical Sciences.

» Another important election: To the 20-year Club of American aeronautical magazines; Earl Findley and his *U. S. Air Services*. At least, now that there are two of us in that category, such a club might be formed. But although Aviation antedated *U. S. Air Services* by some three years, certainly none of us on this staff antedated Earl Findley in any editorial capacity. Earl Findley is the dean of American aeronautical editors and the fact that he has brought his excellent magazine through 20 years of its life practically single-handed is a measure of the stature of the man. He has certainly devoted his life to the development of aeronautics. Long may he wave!

In This Issue

Lots of things that have to do with problems of training and of private flying, also AVIATION's Annual Directory of Airplanes and Engines for civil and for private use. A number of specifications for export military ships are included in a special section, although a more detailed pictorial treatment of all military types was presented in the Air Defense Issue of November, 1938. This time we take off with an account of changing training methods in Europe that are leading to the elimination of private flying and private training over there. Next. . . . a discussion of our proposed training program, together with some statistics on our accomplishments in civil aeronautics. . . . A typical "airplanes at work" story, showing how a number of types, whose specifications appear later in the directory, are doing real jobs in specialized fields, this time in police work in Pennsylvania. . . . Design Trends of 1939, a series of pictorial spreads showing how designers are meeting the requirements of the private market in features for comfort and for safety. . . . And, once more, AVIATION'S Annual Directory and Specification Tables for all air craft in active production, for civil use, for military types available for export, and for all engines in production (civil or military). . . . Finally, accessories of all kinds for airplanes and engines, and for communications, in picture treatment and in the form of a classified index, complete with manufacturers' names and addresses.

» Thus, honors for the living. Last month saw also two news-worthy memorials for the dead. At 12:45 p.m. on Monday, January 9, with fitting ceremony, the name of Juan de la Cierva was unveiled beside the names of other notables in aeronautics on the facade of the Guggenheim School of Aeronautics at New York University. The Hon. Harry F. Guggenheim, Professor Alexander Klemin, Dean Thorndike Saville and Major A. H. Foster, spoke briefly of de la Cierva's contribution to the theory and practice of flight on rotating wings. The occasion marked the 16th anniversary of his first flight in an autogyro. And from the other side of the world came news of another and equally fitting memorial. The citizens of Auckland, New Zealand, have donated a trophy for the promotion of safety in the air and for greater efficiency of aircraft to the memory of Captain Edward Musick and his six companions in the Samoan Clipper lost in the South Pacific on January 12, 1938 on the first commercial flight from America to New Zealand. This trophy is to be awarded annually to any group or body within the United States or the British Empire which, in the opinion

CRUISING TO THIRD PLACE IN THE NEW YORK-MIAMI RACE

This stock Model 18D Beechcraft, never exceeding normal cruising power, averaged better than 190 m.p.h. against headwinds to find itself in third place in this renowned 1100 mile race—**against much higher-powered competitors.**

Its two 330 H.P. Jacobs Model L-6 engines consumed less than 19 gallons of 80 octane gasoline per hour each during the flight. It makes a difference to be

POWERED BY JACOBS

JACOBS AIRCRAFT ENGINE COMPANY

POTTSTOWN PENNSYLVANIA, U.S.A.

JACOBS AIRCRAFT ENGINES EFFICIENT - RELIABLE

Cables—JAECO, POTTSTOWN

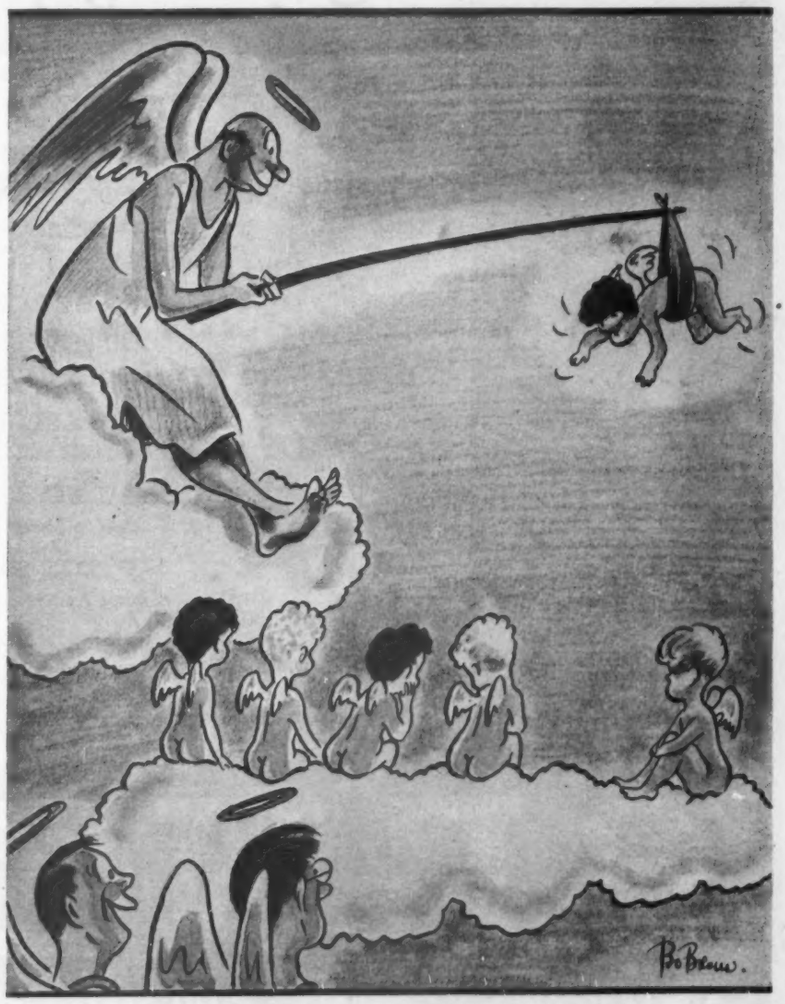
of the Award Committee, makes the most valuable contribution toward the safety of life in the air, with special regard to transoceanic flying. Those of us who were fortunate enough to know Ed Musick, can realize the fitness of the memorial thus established for him.

» SPEAKING of Ed Musick brings to mind another name, Sikorsky—for much of Musick's flying career was spent in Sikorsky ships. While I was in Europe, a book came to my desk which I have only lately had opportunity to open. I read it with double pleasure, first because it is an intimate and exciting record of the whole history of aviation from its beginning down to date, and second, because I count it among my privileges to be a friend of the author. "The Story of the Winged-S" (Dodd, Mead & Co., (New York), $3.) is written with the same quiet modesty and charm that is characteristic of Igor Sikorsky himself. It is the record of a distinguished career.

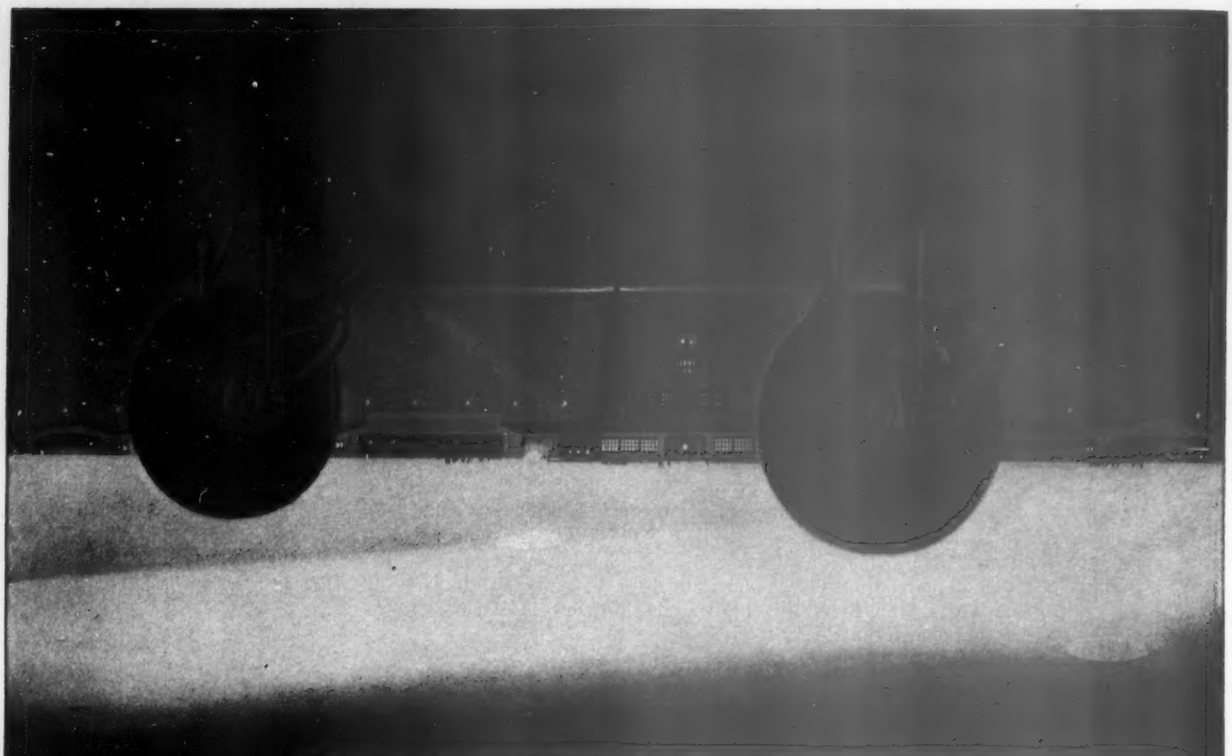
» CAN'T REFRAIN from tossing a large orchid, in passing, to M. Henri Bouché for his splendid technical coverage of the late Paris Show in the December 1938 issue of *L'Aeronautique*. Most people could get more out of reading this particular issue than from a visit to the show itself, for the book contains many details that even the most careful visitor might overlook. Much of the credit must go to M. Gaudefroy, who has fairly outdone himself with his original sketches of airplane details.

» READ a couple of pieces by one Boake Carter coming out of Washington the other day, which left me practically frothing at the mouth. The aviation business is a sick industry, says Mr. Carter (in effect) on account of we haven't any diesel engines. Actually, of course, we have a couple of good diesels already available and have done a whale of a lot of basic research on the subject, but Mr. Carter said flatly that European nations were flying rings around us both in military and commercial aviation because they all used marvelous German-built oil-burning engines and we were stuck with a lot of crude old-fashioned gasoline-burning motors. He stated further that all the American-built transports that had been purchased by European airlines in the last two or three years had already been sold down the river and replaced by German-built, oil-burning machines. That was certainly an interesting bit of news to me because I had just come back from a cruise on the other side and had flown in a number of Dutch and German airplanes without noticing anything of the sort. As a matter of fact, I got a distinct impression that the diesel development was in somewhat of an eclipse in Germany. Certainly, none of their newest military machines are diesel-powered and certainly none of the new commercial machines carry oil-burning engines. I would suggest that Mr. Carter take a good look at photographs of the Junkers JU-90 and the Focke-Wolfe FW-200 Condors. He should note particularly that one of the later types fitted with gasoline engines made the best trans-Atlantic flight of the year, non-stop from Berlin to New York. As for the Dutch, KLM is using Douglas and Lockheed transports exclusively, and have never had a single diesel-powered ship on their roster. This isn't the first time that Mr. Carter has sounded off on a subject about which he obviously knows very little. We suggest that he take the trouble to check up on his "facts".

» OFF THE GROUND and out of sight, straight up in ninety seconds! Now ain't that something, even for an interceptor fighter? But that's the claim (5,000 feet a minute) for the new Curtiss-Wright 21 Interceptor that has just been undergoing test flights at the St. Louis factory. And those who have seen her fly say that there's no mistake about it. Later in this issue will be found a description, some pictures, and some specifications, but with so much talk going around of high speed, high altitude bombers, the importance of a fast climbing fighter of this sort, that can get up where they are in a hurry, is not to be overlooked.



Maguire hopes to cut into that $10,000,000 for training



AIRPLANE PRODUCTS:

BRAKE WHEELS
High and Low Pressure "Streamline" Smooth Contour

TAIL WHEELS — Low Pressure "Streamline"

AXLES — For All Wheels

BRAKES
Mechanically and Hydraulically Operated

OPERATING CYLINDERS FOR HYDRAULIC BRAKES

TAIL WHEEL KNUCKLES
For "Streamline" Wheels, Steerable and Swivelable with Shimmy Dampener

PNEUDRAULIC SHOCK STRUTS
Designed and Tested to Meet Individual Requirements

PILOT SEATS
Standard Army and Navy Type

Engineering Information is Available to those Interested

BENDIX PRODUCTS DIVISION
OF BENDIX AVIATION CORPORATION · SOUTH BEND, INDIANA

BENDIX

AIRPLANE WHEELS · BRAKES · PILOT SEATS · PNEUDRAULIC SHOCK STRUTS

Side Slips

By
ROBERT OSBORN

» FOR SO MANY YEARS we have been seeing pictures—in the advertising of motion pictures, gasolines, cigarettes and automobiles—of airplane pilots, in full dress uniform of leather coat, helmet and goggles, staring off intently and romantically at a point about forty degrees above the horizon, we decided to find out if there were pilots like those anywhere. Accordingly, we assigned our corps of specially-trained investigators to search the highways and by-ways of the aviation world for this phenomenon. They have just reported back, after years of research, that they did find two pilots in similar dress and attitude. One pilot was cussing out a solo student who had taken off right under him when he was coming in to land, and the other was a busy flying instructor looking for rain, so that he

could quit and make some money in the Operations' Office poker game.

» "Q. I would like to know whether a person in an airplane, traveling 300 miles per hour, would be able to reach out and pull in a cannon ball which is traveling beside the airplane at the speed of 300 miles per hour. T. R. K.

A. The National Bureau of Standards says that a person in an airplane traveling 300 miles per hour would be able to reach out and pull in a cannon ball which is traveling beside the airplane at the speed of 300 miles per hour. The force which the person would have to exert would not exceed the force which he would have to exert on the same cannon ball resting on a billiard table to draw it toward him."—From the Answers to Questions Column in the *New Orleans Times-Picayune*.

Seems as if somebody is working up a new act for the National Air Races Program.

» THE LATEST NEWS is that the air preparedness plans of the administration include fifty-hour flight training courses for a large group of students at a number of colleges. If college students react to this course the way they do to most of their other studies, we can expect something like the following:

Professor: Mr. Jones, I'll have to mark you half-absent in the future, if you continue making delayed-opening parachute jumps just to get out of class ahead of time.

Student: Those delayed-openings weren't intentional, Professor. I'm not making out so well in the Parachute-Packing course.

Prof: Mr. Corrigan, you're still reading that compass exactly backward. However, you seem to get good results anyhow, and I must say that your home-work on your own plane was excellent.

Mr. Corrigan: Honest, Professor, I think that compass must have been stuck. Imagine my surprise when—

Prof: I know, Mr. Corrigan, we've been over all that before. Mr. Fuller, I'll have to send you in to talk things over with the Dean if you do any more of this flying through the hangars.

Mr. Fuller: I'm sorry about that, Professor, but you see I was going through a fraternity initiation, and—

Prof: This is a rather extended initiation you're getting, Mr. Fuller. Two months ago that was the reason you chased everybody off the golf course, and three weeks ago you had to fly down the length of Main Street, jamming up all traffic. I suggest you get a new story or a different fraternity.

Now Mr. Brown, we'll see if you really were asleep in my lecture. Please show the class how to make a landing in a cross-wind—

—Uh, Oh! I'll have to mark you

zero on that. Please ask the stock room man to wheel out another plane.

Mr. Brown: I think I should get a partial credit on that question. Only half of the landing gear and a wing were smashed.

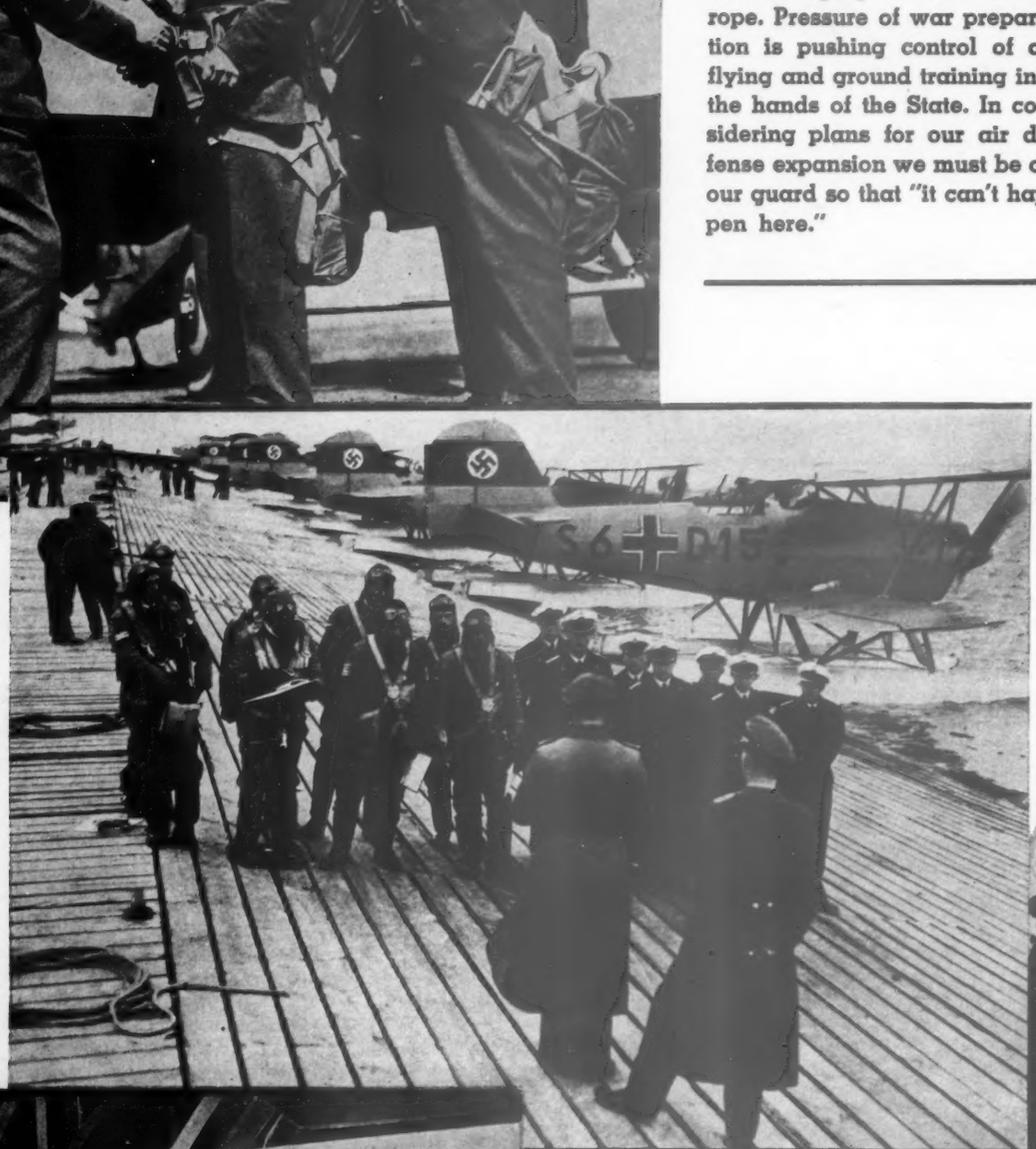
Prof: Alright, I'll give you five. You did walk away from it. Class is dismissed. I forgot that Mr. Eaton cut my lecture on landings, so he won't be down until the gas gives out.

» AVIATION'S LEADING EXPONENT of the white carnation, Mr. Grover Whalen, announces that there will be a 250 ft. Parachute Tower at the New York World's Fair. The Tower, according to plans, will have eleven parachutes with metal rings to keep them open, vertical guy wires to guide them, and shock absorbers to eliminate the impact of landing.

Considering the old and well-proven theory that sailors spend much of their time off in amusement park row boats, we suppose the Fair officials expect this concession to be a favorite with pilots. However, we think the number of aviator customers will be very small. We know very few pilots who are partial to heights in anything but an airplane, and we have a clear recollection of one professional pilot of fifteen years' standing, who nearly passed out at the top of a Ferris Wheel.

★ AVIATION

Private flying is dead in Europe. Pressure of war preparation is pushing control of all flying and ground training into the hands of the State. In considering plans for our air defense expansion we must be on our guard so that "it can't happen here."



Top to Bottom: A hard-boiled R.A.F. Flight Sergeant gives British Flying Cadets their first lessons on the parachute.

A group of young German seaplane pilots get their instructions for an over-water practice mission.

Students in one of Germany's aviation schools learn some of the rudiments of bomb dropping.

Right: Even the girls in England are being organized. A group of Air Force Auxiliaries takes an official salute.

for February, 1939 ★ ★ ★ ★

North, South, East and West, on flying fields and in factories, the youth of the world is

—"MARCHING as to WAR!"

By S. Paul Johnston

Editor of AVIATION

A FEW WEEKS AGO I sat in a Berlin office across the desk from one of the most popular men in German aviation, a man who heads up what is probably the largest single aeronautical organization in the world, Korps-führer Generalleutnant Christiansen, head of the National sozialistische Fliegerkorps (NSFK). He told me that his active Korps-men, in uniform, organized in some 520 Sturms scattered over Germany, number over 65,000. ("—and most of them are flying", put in Standartenführer Sönnichsen, the General's aide). Besides taking care of the flight and ground training of this active group (whose ages range from 18 to 35) the NSFK supervises the training (with models and on sail-planes) of over 100,000 members of the 13 to 17 year-old Hitler Youth (*Hitler Jugend*=H-J) who are earmarked for aviation, and the model building activities of 1,000,000 *Pfimpfe,* the schoolboys between 10 and 12 whose greatest ambition in life is to wear the winged swastika of the German Air Force.

Quite a job this, for General Christiansen is thus responsible for all the aviation training activities in the Third Reich outside of the Air Force proper. This includes even the reservists who have served their time in the *Luftwaffe* and have gone back into civil life.

Membership in the NSFK is voluntary, but there seems to be no lack of material for membership. And why should there be? The NSFK offers advantages to air-minded German youth that are not available elsewhere in the world, except possibly in Italy (and in Russia?) where similar programs have been set up. Boys may begin their aviation career at 10 years of age when they are still in the grammar schools, making simple models with material furnished by NSFK, to plans developed and distributed by NSFK, and under the supervision of competent instructors trained in special NSFK schools for the job. As they progress through the H-J, they move on to larger and more complicated models, including models powered with miniature gasoline engines, and in time, those who are qualified graduate into the gliding and soaring camps scattered all over Germany. Here they may qualify for their soaring licenses and then move on into the power flying school where instruction is given on machines furnished by the Korps and by instructors of the Korps. All this, as

Photos opp. page from European Wide World

I understand it, is provided free of charge, and is designed to be carried on along with regular grammar and high school work. All this goes on before the boys become members of the *Arbeitsdienst.*

A word about the *Arbeitsdienst.* Every German boy and girl irrespective of social or economic position, must put in one year of practical labor of some sort before they are 20 or 21 years of age. This labor year is quite independent of, and precedes the required military service years for the boys. The year may be spent in organized labor service camps (somewhat similar to our C.C.C. organization) or in work on farms, as clerks, or in the state transportation or other services. The girls serve their time in German households, learning the housewifely duties. During the service year, the boys who have come up through the aviation section of the H-J and who may already be members of the NSFK continue their flight training in their spare time in the nearest NSFK *Sturm.*

Since the physical condition of prospective pilots is such an important consideration, the NSFK program carries along with it a fully developed plan for health-building through outdoor sports. Such things are of almost equal importance with the actual flight training.

Thus every year when the classes are called to the colors for their regular military service, there are large numbers of boys immediately available for selection for the air force who already have their soaring and lower grade pilot licenses. The actual number of pre-air-force-trained pilots that become available every year is not generally known. As the NSFK program moves along, however, it is obvious that an increasing number will come up every year. All through the training period, step by step, the processes are highly selective. By the time the boys do become eligible for training in the *Luftwaffe* proper, they represent the cream of Germany's flying youth, both physically and in flying aptitude. No other country in the world, so far, (again, with the possible exceptions of Russia and Italy) have such a nucleus of trained personnel on which to draw for their fighting pilots.

Terms of service in the *Luftwaffe* range from the two-year minimum required up to 12 years on a volunteer basis. It is, of course, from the long-time enlistments that the highly trained expert air force personnel eventually evolves.

As a practical matter, there is no

Europea

Young German Air Force cadets get a practical lesson in radio and navigation.

private flying, as we know it, in Germany. All sport flying is an integrated part of the military training program and is carried on under the auspices of the NSFK. All machines belong to the Korps and are supplied by appropriations from the Air Ministry.

The types in wide use are the Heinkel *Kadet,* the Bücher *Jungemeister,* the Focke-Wulf *Stieglitz* and the Klemm monoplanes. The actual number of such machines is, of course, unknown, but some significance attaches to the fact that where in 1937 the NSFK assembled 180 airplanes of these types for the *Deutschlandfluges,* by May 1938 over 400 machines turned out for the 'Round-Germany flight. It will be most interesting to see how many can be mustered this year.

Beside these more or less standard models now used by the NSFK, I am told that three new light types of machine were being developed, chiefly for training work in the Hitler Youth. These machines were said to be two-seater (side-by-side) monoplanes powered with 40-hp. engines and good for about 110 m.p.h. top speed. No other details seemed to be available, but I suspect they will turn out to be machines of a conventional type.

I picked up wholly unconfirmed rumors of orders for sail-planes (intended also for H-J training) in numbers up to 4,000. Whether or not this is an exact figure, certain it is that hundreds, if not thousands, of gliders and sail-planes are now in use in Germany. Besides the factory-built machines, many NSFK *Sturms* have two or three under design or construction, and many of the apprentice school groups attached to factories are building sail-planes and gliders as a form of practical exercise. As far back as December 1935, Edmund T. Allen, just back from his first trip into Germany, reported that the German glider camps at that time had a capacity of between three and five thousand glider pilots per year. Even if that figure has not been improved upon in the intervening three years (and the chances are that it has gone up substantially), it is still pretty good. The least that could be said is that such a volume of trained sail-plane pilots provides a large and continuously growing reservoir of partly air-trained men on which the power-plane training schools may draw. Motorless flying is not necessarily considered a pre-requisite for power-flying, but it is obviously a very valuable preliminary.

Again, no statistics are available as to the number of people who are actually doing power flying in the NSFK schools, but if we would take Colonel Sönnichsen's statement as given in the first paragraph, and divide it by three, the figure comes out somewhat over the number which President Roosevelt has mentioned as desirable for our needs in the immediate future. But bear in mind that what we are talking about is in Germany a *fait accompli,* and not a subject for debate and for future decision. No matter what we do about it now, we must always face the fact that Germany already has a

Acefoto

Young Russians intent on learning something of the modern fighting plane.

two to three year lead on us and on the rest of the world with respect to pilot training as well as in terms of airplane production.

But the pilot training is only one angle to the personnel problem. For every active pilot it is necessary to have a dozen men on the ground in maintenance and servicing crews, in meteorological departments and in communication service. Beside that, any manufacturing industry run on the scale of Germany's today, must have a large reservoir of skilled and semi-skilled people on which to draw to man its factories.

It is inconceivable that the heads of Germany's Air Ministry should have overlooked any bets in this direction. Certain it is that the German technical schools and universities are turning out hundreds of highly trained specialists for the technical ground services of the *Luftwaffe*. Certain it is also that large numbers of the NSFK personnel (those who cannot qualify as top-flight pilots), are being groomed to take care of the necessary mechanical work to keep both the NSFK and the air force machines in the air.

On the methods used to train factory personnel, I can offer some first-hand evidence, for between my 1936 and 1938 visits in Germany, I was shown in detail four or five of the large and well organized apprentice schools that are run in connection with the manufacturing plants. The newest, and perhaps the most highly developed school of this sort, and one which gives some idea of the direction in which Germany is heading in this connection, is that the new Heinkel plant at Oranienburg. The apprentice school there is in a building of its own, adjacent to the buildings that house the manufacturing departments. Built on a hollow square plan, three sides are taken up with shops of all varieties, including forging, heat-treating, machining, sheet metal working, etc. The fourth side houses the classrooms for theoretical work, and the dormitories and mess-halls. The training equipment, machine tools, etc., are all brand new, obviously of the best make. As a matter of fact, the equipment of this school is more complete and better organized than the equipment of many of our smaller airplane producing plants.

The Oranienburg school provides for 600 boys between the ages of 14 and 18 on a three to four-year course basis. The boys live together in a semi-military fashion indulging in group sports and other organized activities as well as their classroom and shop work. As I understand it, they are provided with their living and, as they progress through the school, are paid a certain nominal wage. Boys thus trained are fitted to move out into the factories to take up key positions on the production lines after they have had a certain amount of practical experience. From such highly trained groups will come eventually the foremen and group leaders which will provide the nucleus of trained personnel in the event of a greater war-time expansion.

The Oranienburg school is, of course, only an example of the sort of thing that is going on in factories all over Germany, and it is not a new idea, for highly organized apprentice courses have been in operation practically from the beginning of the new German aircraft building industry. One thing, of course, stands out. Just as there is no private flying or private flight instruction in Germany, there are no independently operated schools for the training of mechanics or factory workers. Personnel training, both on the ground and in the air, is a part of the completely integrated German Aviation program.

This serves as further illustration of the fundamental difference between Germany's situation and our own. We, as a democracy, must wait for the actual appearance of an emergency before we can (or are willing to) centralize the control of our whole aviation for operation at maximum efficiency. Germany, on the other hand, operating under a totalitarian government and on a system of a completely closed economy, put herself on a war-time footing long before any actual emergency existed. We in the United States are properly afraid to risk our fundamental liberties by adopting the totalitarian plan. We always must sacrifice a certain degree of efficiency as the price of freedom for the individual. But in working out our new aviation program to compete with so-called "dictator" countries in Europe, we must work out some form of cooperation among the several elements of our aviation industry (and the military services) that is better than anything that we have succeeded in doing to date, or some day we may wake up to find that the price we have been paying has been too high.

In following the course of Italy's training program over the past few years it seems obvious that there has been a very close connection with the German plan. Instead of the NSFK, we find the RUNA (Royal National Aeronautical Union). Its purposes and its methods of doing business are much the same. Model work begins with the younger boys, the *Figlio della Lupa* (Sons of the Wolf) and with the *Balilla,* corresponding roughly to the German *Pfimpfe* and the *Hitler Jugend.* At approximately the same ages as in Germany, the boys progress into the RUNA for advanced model building, mechanical and ground course instruction, training on sail-

(*Turn to page 101*)

20,000
10,000
2,000

PORTS, PLANES, PILOTS

While the countries of Europe have found it necessary to militarize their civil aviation, we haven't been doing too badly under our system of private enterprise.

A PREMATURE ANNOUNCEMENT by the White House of a proposed CAA plan to train some 20,000,000 new pilots through the medium of a $10,000,000 annual program in the established colleges caused some understandable concern among flying schools and fixed-base operators all over the country. Especially, since hard on the heels of the release came a flood of rumors of the establishment of new government-owned schools to be staffed by instructors from the Army and the Navy. People who had spent their years and their money in building up a business saw ground to be cut away under their feet by direct government competition. Non-collegers screamed "Discrimination!"

The real trouble, of course, was that the thing went off half-cocked. As we read it, the college training scheme is very much on an experimental basis. The results that are obtained from the trial program this Spring (financed by $10,000 from the National Youth Administration) will determine whether or not the larger scheme is practical. And since the plan calls for the use of the facilities of the qualified established fixed-base operators located near the colleges selected, we can't see where anyone already in the aviation industry is going to be the loser. As Grant Mason said in his speech at Miami, "—we intend to utilize the competent civilian flight instructors now available throughout the country, and to use the self-same training planes with which they are now teaching." Further, "—it is our plan to strengthen and stimulate the private flying industry in every possible manner—to utilize existing airports in the vicinity of the schools and colleges included in the plan. In effect, local flying instructors will simply become faculty members of the educational institutions—". And no fixed-base operator that we know would object to being called "Professor," if his school was full to capacity with students whose ability to pay for flying time was not limited by what extra they could shake down from Papa, but was guaranteed by the Great White Father in Washington. Also, as we understand it, such flying courses will probably be put on an "extension" basis.

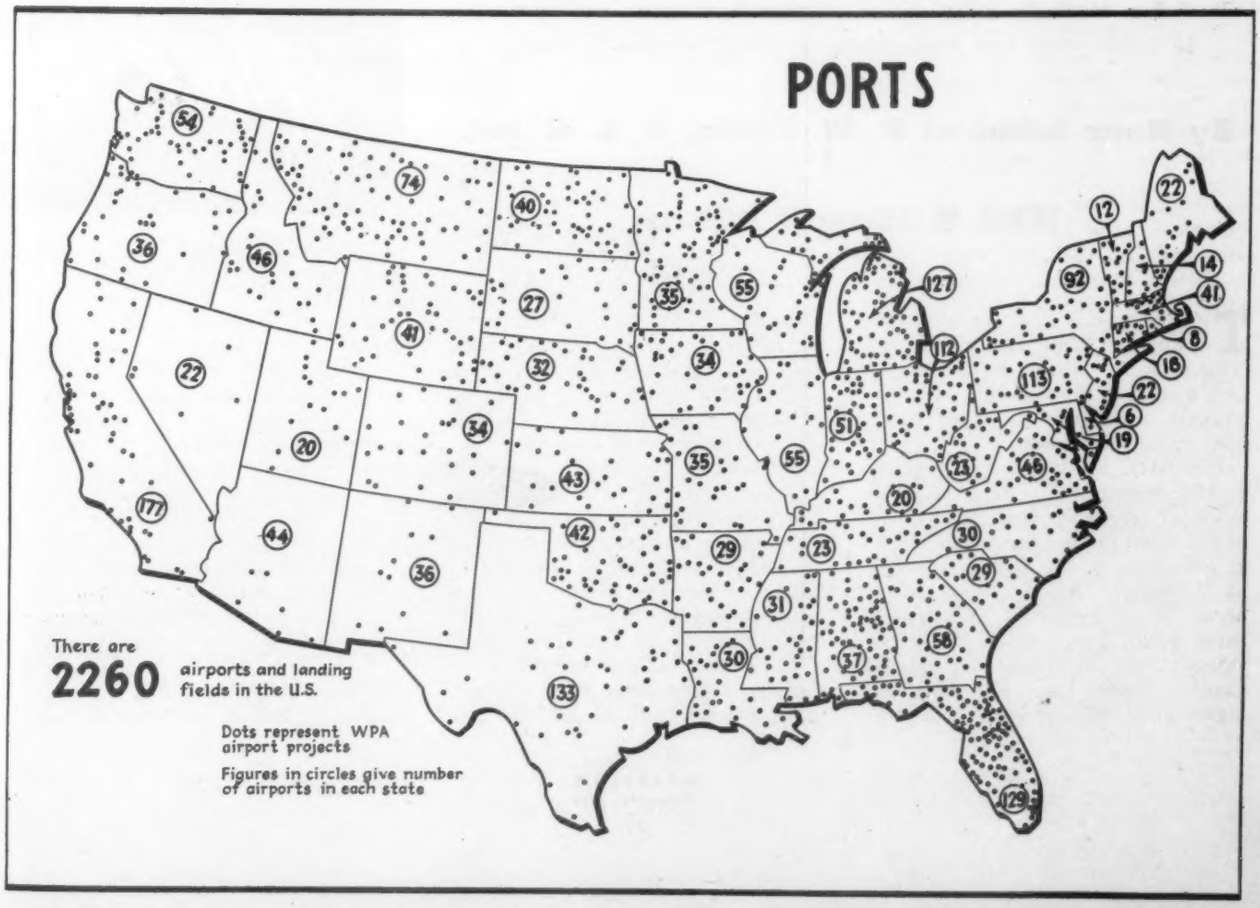
As for the larger flying schools, although no definite announcements have yet been made, it is a fair guess that they will be kept filled to capacity with pre-Air Force pilots and mechanics. It would seem only good sense to adopt some such plan as is now in use in England under which the military services contract for the entire output of a qualified school. Men already enlisted in the air forces are sent to the civilian schools for their first 50 hours of flight, and for their ground school training. Those who survive the highly selective processes in these primary schools thus

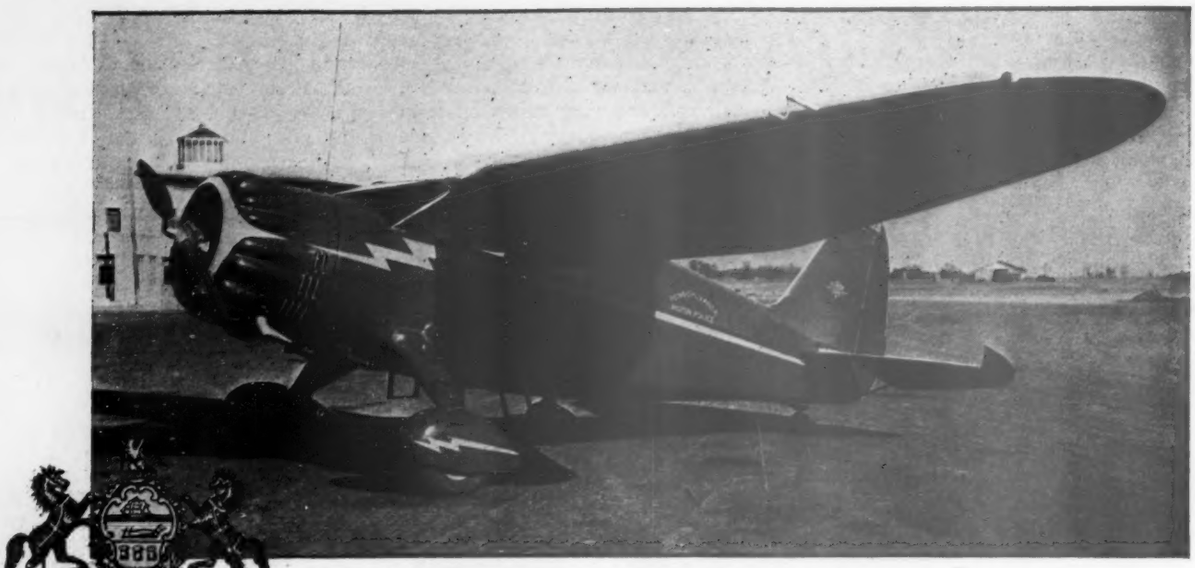
PLANES
C. A. A. Certified
10,000
1,159 more are uncertified
Less than 300 of this number are on commercial airlines
Besides, there are 221 gliders
Private planes in the hands of U.S. private pilots in 1938 flew over 100,000,000 mi.
4,000 times around the world

come into the air force proper with a sound foundation on which to build their military work. We have a dozen excellent schools available in this country which could feed into Randolph and to Pensacola a constant stream of pre-trained cadets, and provide a continuous supply of first rate mechanics.

The greatest danger, as we see it, is to our private flying, as such. If we aren't careful we may find ourselves in the condition of those European countries whose private flying has disappeared entirely, absorbed completely by the State under pressure of purely military considerations. Again, as in the case of our airplane production problem, we are fortunate in having time enough to work out some sort of balanced program without being forced by an emergency into something we may not want.

As the charts on these pages will show, we have done fairly well under our system of private initiative. Two thousand airports, ten thousand civil aircraft, and twenty-odd thousands of civilian pilots is not a bad showing for a poor old democratic country, in spite of all that the "dictator" boys say about their own efficiency. But we must admit that we have made progress more or less in spite of ourselves. So far, there has been very little in the way of coordinated encouragement for non-scheduled aviation coming out of Washington. The important thing for us to do is to recognize that we already have "got something," and then to go on from there with some rational, long-range planning that will make use of all available experience at home and abroad to supply the personnel need of our defensive forces without killing off individual initiative or hopelessly crippling our private flying.


PORTS
There are
2260
airports and landing fields in the U.S.
Dots represent WPA airport projects
Figures in circles give number of airports in each state



Lycoming powered Stinson now used by Pennsylvania Motor Police.

Traffic Violators BEWARE!

Next time you try to talk yourself out of a traffic ticket in Pennsylvania remember the officer may have accurate information on your indiscretion broadcast from the State Police airplane. The author tells how he uses airplanes in police work and emphasizes the need for more of them.

By Rear Admiral P. W. Foote, U. S. N. ret.

Commissioner, Pennsylvania Motor Police

With William L. Wilson

Aircraft at Work!

THE NAVY, it is said, prepares constantly for something which will never happen. A state police force in such a state as Pennsylvania prepares, however, for something which is almost certain to happen.

Inevitably, the sudden crisis of industrial trouble will be repeated. The shock of irrestable flood waters will be felt again in the Conemaugh Valley at Johnstown or the Golden Triangle of Pittsburgh. Again serious prison breaks or the dangerous dash of cornered bandit gangs will make whole sections the equivalent of armed camps. Traffic jams will clog our highways at the tag end of mid-summer holidays and the certain increase of automotive travel will add new hazards to public safety. Policemen will be shot down in pursuance of their duty in remote sections, far from essential surgical and hospital aid.

For such police crises as these, we of the Pennsylvania State Motor Police are beginning to prescribe aviation as an auxiliary service which must not be neglected. In aircraft, we believe we have one more arm of usefulness which will increase greatly the effectiveness of our public service.

The Pennsylvania Motor Police now operates a four-place Stinson monoplane, flown by one of our own men who carries a captain's rank. The use of this plane is largely an experiment, designed to provide us with information which will equip us to increase our aeronautical corps as it becomes desirable and possible. In this experiment, air-minded leaders of the State, including Gov. George H. Earle, are taking a keen and helpful interest.

The traffic problem is one of major importance. In this field police aviators can provide routine day-by-day service quite different from the more spectacular deeds of criminal warfare.

Using two-way radio, traffic experts can soar above congested highways, patrolling difficult stretches or large

sectors of trunk systems. By contact with highway substations much can be done to clear up the intermittent trouble points which speedily transform a super-highway into the traffic equivalent of a rural lane.

Pennsylvania motor policemen and authorities in other states have emphatically proved the practical quality of this work. New York, New Jersey, Pennsylvania and other states have co-operated with commercial radio stations to broadcast directly to auto radios valuable information on the best and speediest routes to key destinations, such as the Holland Tunnel to New York City or the Delaware River Bridge between Philadelphia and Camden. This data, interspersed in regular commercial programs, has largely been gathered by air surveys.

Last Labor Day, our force used a different means—one that is expected to prove of greatest usefulness. The Commissioner undertook to survey much of the southwestern mountainous area, near Pittsburgh and found he was able to direct motorcycle officers directly from their barracks to points where slow-moving trucks had become impassable obstructions, where accidents or other temporary hazards had seriously impeded the flow of holiday travel, or where reckless drivers were at large. The patrolmen, of course, took prompt action in the situation, pulling heavy trucks from the roads, routing travel over less-congested areas or acting in the other numberless ways which are open to good traffic officers.

If planes were available, hundred-mile highway links could be patrolled in their entirety at least once every hour by air observers. The effectiveness of this service, with perhaps ten or twenty miles of road constantly under the fliers' eyes, contrasts sharply with the present necessity of deploying a half-dozen or more police cars or motorcycle units for the same duty, with each these men handicapped by being in only one restricted spot at one time and each restricted in his own operations by the congestion of the heavy traffic he is attempting to combat.

A giro drops in where airplanes fear to land.

Ambulance service: Major D. A. Johnston (rear seat); Captain A. M. Banks (pilot); Sergeant W. T. McAlpin (right front) all of Pennsylvania Motor Police.

It must be noted that police generally modernize after the underworld. Progress made by law enforcement bodies frequently follows in the wake of new wrinkles introduced by law breakers, and then comes to pass only because the law is put on the defensive and must retaliate or be helpless.

This unfortunate condition occurs because legislatures and other appropriating bodies are inclined to be close-pursed toward police and too frequently will not invest in improvements or modern equipment until forced to do so by ingenuity and progressiveness on the part of the crooks.

Police weapons have become more efficient and lethal only because the same guns fell into criminal hands first. Many murderers' automatics killed valiant officers before police were generally outfitted with such arms. The deadly spray of the submachine gun was turned on the forces of law and order in many a costly meeting before police were allowed to purchase these weapons and go to battle properly armed.

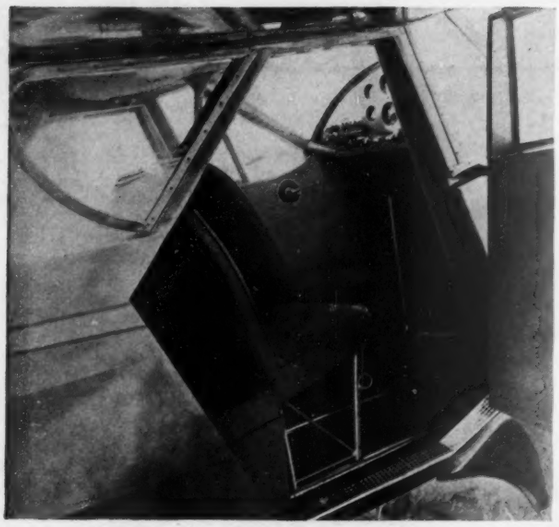
Even today, the automotive equipment of most police forces is inferior to that which thieves can steal or buy. We can be outsped and out-maneuvered by high-powered cars that would be exorbitantly expensive to purchase in quantity for any police department.

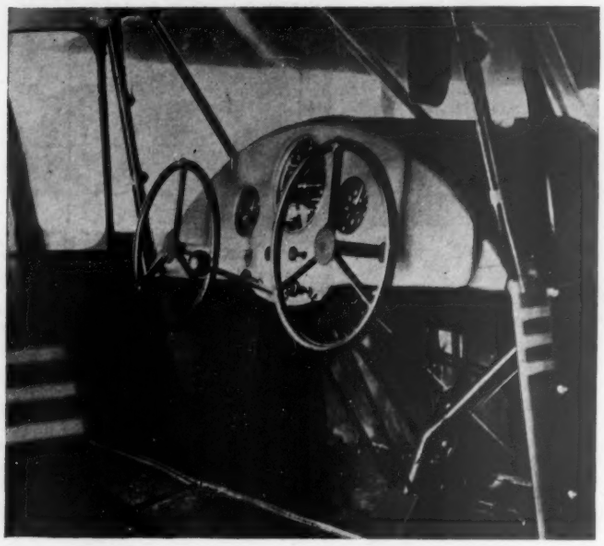
Federal and state police, however,

(Turn to page 104)

Interiors for

Private aircraft for 1939 are designed for better vision, and have fewer things for passengers to fall over getting in and out.





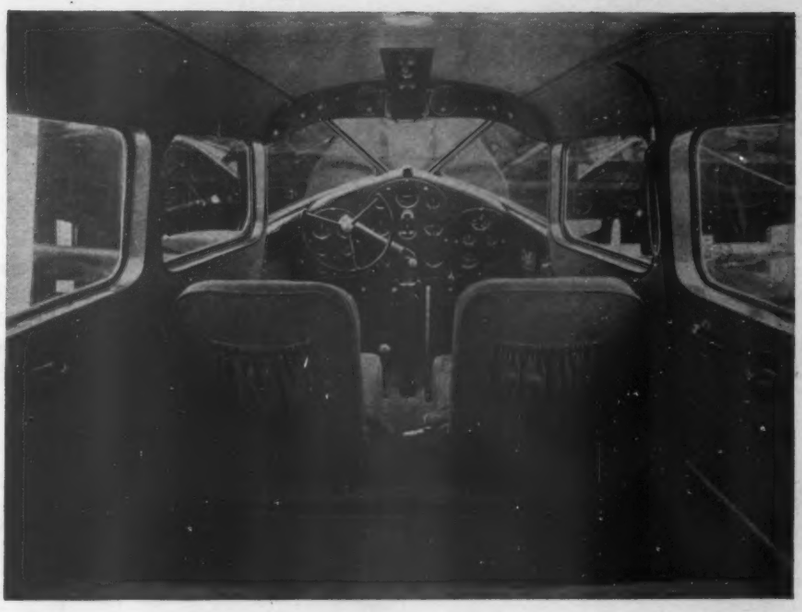
An interior shot of the Fairchild 24 for 1939.

Top: The Copilot's seat slides back to provide entrance space in the Cessna Airmaster.

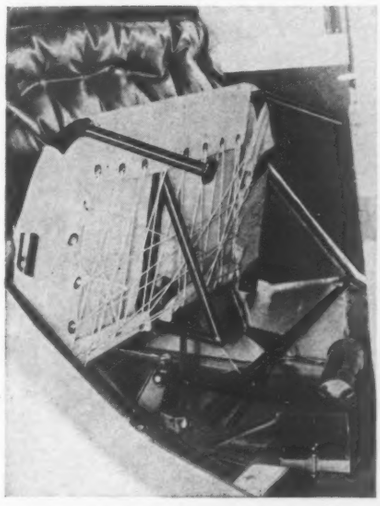
Above: Push-pull wheel control cleans up the floor space in the Taylor-Young ships.

Right: There's plenty of room for the family in the rear seat of the Stinson SR 10C.

Comfort



You can see all around from the cabin of the Fairchild 45.



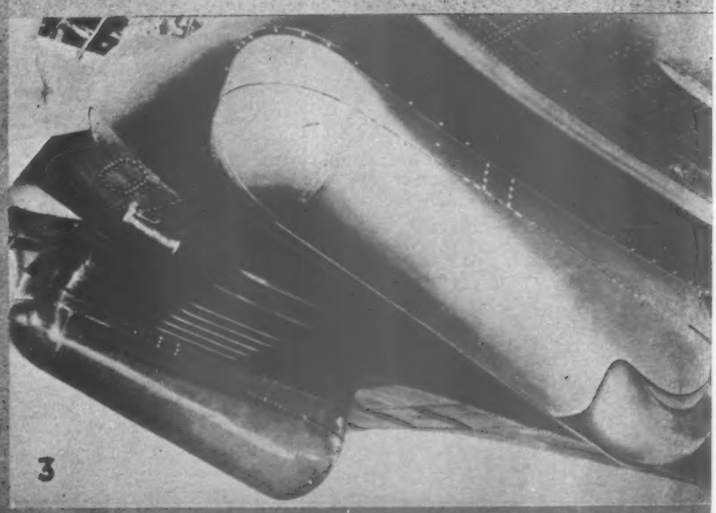
The Cub seat is hinged for access to controls and battery.

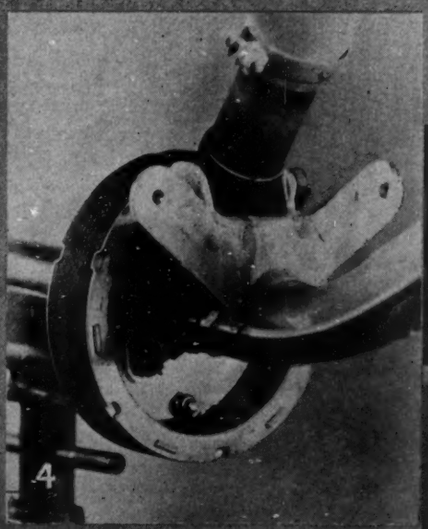
An inviting interior,—the D17 R Beechcraft.

Mighty like a big transport is this interior of the Beech 18.

For Happier

LANDING GEARS are growing simpler and cleaner, easier to operate and to maintain. And with this progress belly landings are growing more infrequent. Attractiveness of the tricycle landing gear is being recognized and the principle is under consideration for several future designs.





1. The Aeronca Chief has a good looking cowling
2. Simplicity and cleanness characterize the Ryan gear
3. The Curtiss-Wright Interceptor with wheels tucked in
4. Cub's full hydraulic brakes
5. Fairchild 45 retractable gear
6. It's easy to get into the Gwinn Air Car
7. For better vision — the Waco N tricycle gear
8. A ski installation by Air Transport Equipment Inc.
9. Full airwheels on the Cessna
10. Landing gear of the Luscombe 50
11. Beech 18 retractable gear
12. A Fairchild 24 on Edo Floats

Landings

Aircraft cowlings have been improved immensely and even the light, inexpensive ships are coming out of the factories with workmanship and finish that would do credit to an automobile plant. It is becoming increasingly difficult to single out the less expensive ships from the higher priced models.

6

7

8

9

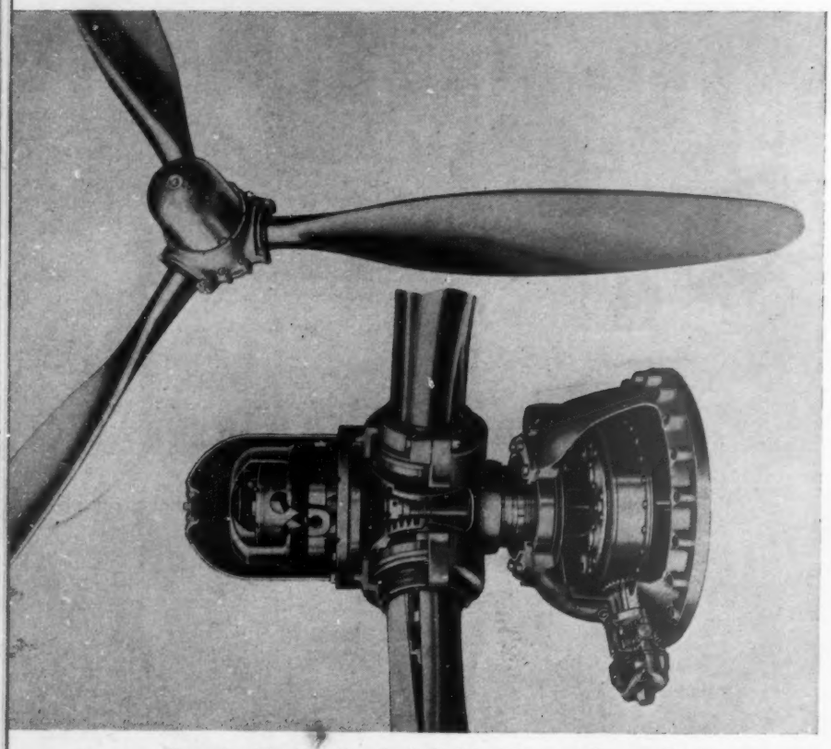
10

11

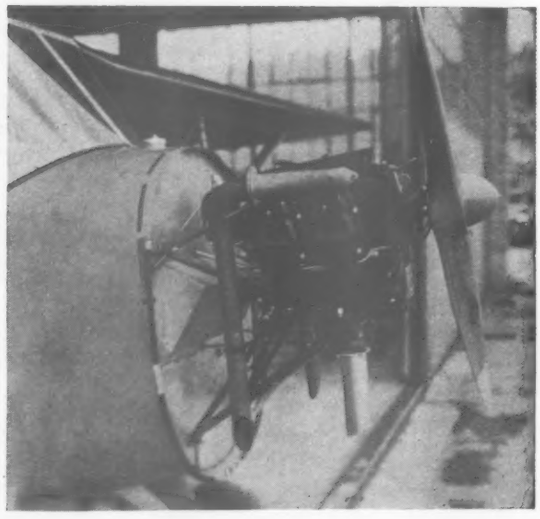
12

PROPS **and POWER**

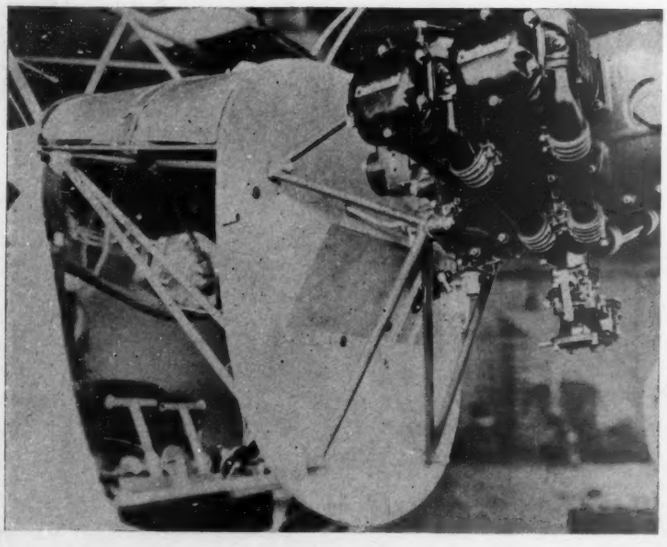
WHILE THE WORKING PARTS of automobiles are becoming less accessible, airplane design is moving in the opposite direction. Through the use of patented fasteners and ingenious cowling designs, it is possible to expose most aircraft engines completely in almost no time. In the propeller field feathering and controllable pitch types are making important contributions to safety and efficiency.



How the Hamilton-Standard Hydromatic propeller mechanism operates. Features of the design are greater pitch range and feathering blades.



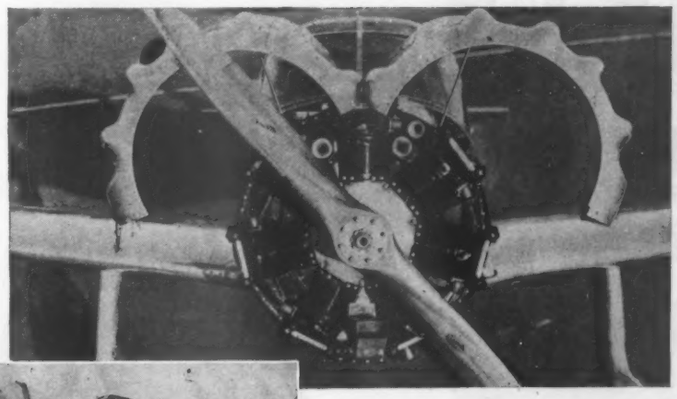
Aircooled Motors (Franklin) installation in the Aeronca Chief. Essential parts of the power plant are readily accessible.



Left: The uncowled engine installation of the Continental 50 in the Aeronca Chief leaves ample space for servicing.

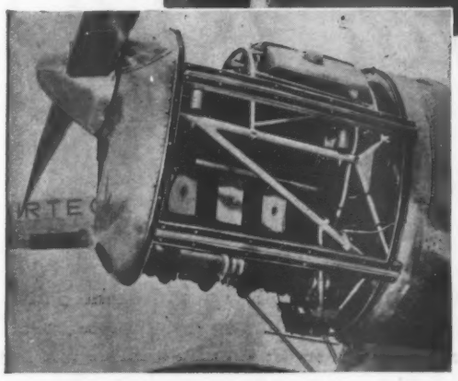
Below: The Continental 50 installation with cowling closed makes a highly efficient and attractive installation.

PLANTS



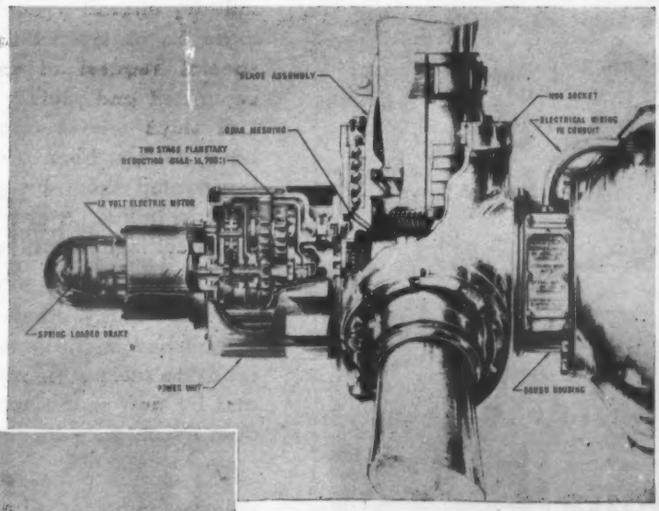
In the Ryan ships the cowling is hinged at the top and exposes the entire engine when opened.

The Lycoming Controllable propeller installed in a Stinson cabin plane.



It's easy to get at the engine in the Luscombe 50 when the cowling is opened.

An in-line engine installation by Ryan which effectively exposes the Menasco power plant. (above)



Right: Mechanism of the Curtiss - Wright controllable.

Below: A typical installation.

Both side doors open in the cowling of the Curtiss-Wright 21 for better servicing.

AMERICAN PLANES AND ENGINES

for 1939

IN the pages that follow we present photographs, line drawings and complete specifications of the aircraft now in production for private and commercial use, specifications of military aircraft available for export, and photographs of typical military aircraft. At the special request of manufacturers we have separated and plainly marked those commercial ships whose approved type certificates have not yet been granted and have further segregated them by printing their specifications in italics. A key to the symbols used in the specification tables is on page 41.

In addition to the airplanes herein listed there are many others under development by established manufacturers who are not yet ready to release information on their products and by new manufacturers who are eager to gain acceptance for their designs.

The engine pages contain complete specifications for power plants in current production and photographs of typical engines in all horsepower groups. Both military and commercial engines are included.

Typical accessories and radio equipment for use aboard the airplane have been pictorialized beginning on page 60 and a complete accessory directory begins on page 68.

INDEX OF AIRCRAFT

Abrams Aerial Survey Corp., 606 Shirwassee St., Lansing Mich. 35
Talbert Abrams, President.

Aeronautical Corporation of America, Lunken Airport, Cincinnati Ohio 34
Walter J. Friedlander, Pres., Carl I. Friedlander, V. Pres., J. A. Weagle, Chief Engr.

Air Transport Mfg. Co. Ltd., 614-616 West Colorado Blvd., Glendale, Cal. 35, 47
E. L. Hollywood, Pres., A. K. Peterson, Chief Engr.

Akron Aircraft Company, Akron, Ohio 34
J. H. Bunting, General Manager.

Barkley-Grow Aircraft Corp., 13210 French Rd., Detroit, Mich. ... 46
H. B. Grow, Pres., D. C. Maier, Chief Engr.

Beech Aircraft Corp., East Central Ave., Wichita, Kans. 42, 46
Walter H. Beech, Pres., T. A. Wells, Chief Engr.

Bell Aircraft Corp., Buffalo, N. Y. 50
Lawrence Bell, Pres., Ray V. Whitman, V. Pres.

Bellanca Aircraft Corp., New Castle, Del. 43, 47, 50
G. M. Bellanca, Pres., A. F. Haiduck, Chief Engr.

Boeing Aircraft Co., Georgetown Station, Seattle, Wash. 46, 50
C. L. Egtvedt, Pres., R. J. Minshall, Asst. Gen. Mgr.

Brewster Aeronautical Corp., Long Island City, N. Y. 50
James Work, Pres., Temple Joyce, V. Pres.

Lawrence W. Brown Aircraft Co., 5844 Inskeep Ave., Los Angeles, Cal. 35
Lawrence W. Brown, Pres., Otto E. Strahlmann, Chief Engr.

Burnelli Aircraft, Ltd., Keyport, N. J. 46
Vincent Burnelli, Pres.

Cessna Aircraft Co., Cessna Airport, Wichita, Kans. 42
Dwane L. Wallace, Pres., Tom Salter, Chief Engr.

Consolidated Aircraft Corp., San Diego, Calif. 51
R. H. Fleet, Pres., I. M. Laddon, Chief Engineer.

Curtiss-Wright Corp., Curtis Aero Division, Buffalo, N. Y. 50
Burdette S. Wright, Vice Pres. & Gen. Mgr.

Curtiss-Wright Corp., St. Louis Airplane Div., Lambert Field, Robertson, Mo. 35, 48, 50
C. W. France, Gen. Mgr.

Dart Manufacturing Corp., Port Columbus, Columbus, Ohio 35
Knight K. Culver, Jr., Pres., Charles Bates, Sales Mgr.

Douglas Aircraft Co., Inc., 3000 Ocean Park Blvd., Santa Monica, Cal. 47, 48, 50
Donald W. Douglas, Pres., A. E. Raymond, Chief Engr.

Fairchild Aircraft Corp., Hagerstown, Md. 42, 43
Sherman M. Fairchild, Pres., A. J. Thiebolt, Chief Engr.

Fleetwings, Inc., Bristol, Pa. 43
Carl de Ganahl, Pres., Wilson L. Sutton, Chief Engr.

Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y. .. 48, 50
L. R. Grumman, Pres., W. T. Schwendler, Chief Engr.

Gwinn Aircar Co., 777 Hertel Ave., Buffalo, N. Y. 43
Jos. Gwinn, Pres., Joseph M. Gwinn, Jr., Pres. & Chief Engr.

Hall Aluminum Aircraft Co., Bristol, Pa. 50
A. M. Hall, Pres., C. F. Pape, V. Pres. & Treas.

Howard Aircraft Corp., 5301 W. 65th St., Chicago, Ill. 43
Ben. O. Howard, Pres., B. D. DeWeese, V. Pres. & Gen. Mgr. Walter T. Brownell, Chief Engr.

Jones Aircraft Corp., P. O. Box 114, Schenectady, N. Y. 44
Ben Jones, Pres., Aitkin L. Matthews, Vice Pres.

Kellett Autogiro Corp., Island Road & Laycock Ave., Philadelphia, Pa. 36
W. Wallace Kellett, Pres., R. H. Prewitt, Exec. Engr.

Luscombe Airplane Corp., Mercer Airport, West Trenton, N. J. 36, 37
Don A. Luscombe, Pres., Charles E. Hastings, Jr., Vice Pres.

Lockheed Aircraft Corp., Burbank, Calif. 48, 49
Robert E. Gross, Pres., Hall L. Hibbard, Vice Pres. & Chief Engr.

Martin, Glenn L., Co., Baltimore, Md. 48, 50
Glenn L. Martin, Pres., B. C. Boulton, Chief Engr.

Miller Aircraft Corp., Springfield Airport, Springfield, Mass. 36
H. W. Miller.

Monocoupe, Corp., Lambert Field, Robertson, Mo. 37, 44
Clare W. Bunch, Pres., James V. Reynolds, Vice Pres.

North American Aviation Inc., Inglewood, Calif. 50, 52
J. H. Kindleberger, Pres., J. L. Atwood, Chief Engr.

Ong Aircraft Corp., Wichita, Kan. 44
William Ong.

Pasped Aircraft Corp., 221-A W. Broadway, Glendale, Cal. 38
F. J. Pedersen.

Phillips Aviation Co., 412 West Sixth Street, Los Angeles, Calif. 36, 37
James A. Phillips, Jr., Pres. & Gen. Mgr.

Piper Aircraft Corp., 820 Bald Eagle St., Lock Haven, Pa. 38
Theodore V. Weld, Pres., W. C. Jamouneau, Vice Pres. & Chief Engr.

Porterfield Aircraft Corp., 1720 Wabash Ave., Kansas City, Mo. 38, 39
E. E. Porterfield, Jr., Pres., M. S. Porterfield, Vice Pres.

Rearwin Airplanes, Fairfax Airport, Kansas City, Kan. 39
R. A. Rearwin, Partner, Dale Hamilton, Chief Engr.

Orrin E. Ross, 78 Park Avenue, Amityville, N. Y. 38

Ryan Aeronautical Co., Lindbergh Field, San Diego, Cal. .. 39, 44, 52
T. Claude Ryan, Pres., Millard C. Boyd.

Security Aircraft Corp., 2735 E. Spring St., Long Beach, Cal. .. 40
W. B. Kinner, Pres., Max B. Harlow, Chief Engr.

Seversky Aircraft Corp., Farmingdale, L. I., N. Y. 52
J. L. McClane, Gen. Mgr., C. Hart Miller, Eng. Asst. to the Pres.

Sikorsky, Div. United Aircraft Corp., Bridgeport, Conn. 49, 52
R. W. Clark, Gen. Mgr., Igor I. Sikorsky, Engr. Director, M. E. Gluhareff, Chief Engr.

Spartan Aircraft Co., Box 2648, Tulsa, Okla. 44, 52
W. G. Skelly, Pres., E. O. Weining, Chief Engr.

Stearman Aircraft Co., Wichita, Kan. 52
J. E. Schaefer, Pres. & Gen. Mgr., Harold W. Zipp, Ass't. Sec. & Chief Engr.

Stearman-Hammond, South San Francisco, Cal. 40
Lloyd Stearman, Pres., M. C. Haddon, Chief Engr.

Stinson Aircraft Div. Aviation Mfg. Corp., Wayne, Mich. 45
W. A. Mara, Pres.

Taylor-Young Airplane Co., Alliance, Ohio 40
C. G. Taylor, Pres., Raymond Carlson, Chief Engr.

Vought Division, United Aircraft Corp., East Hartford, Conn. 52
R. W. Clark, Gen. Mgr., R. B. Beisel, Chief Engr.

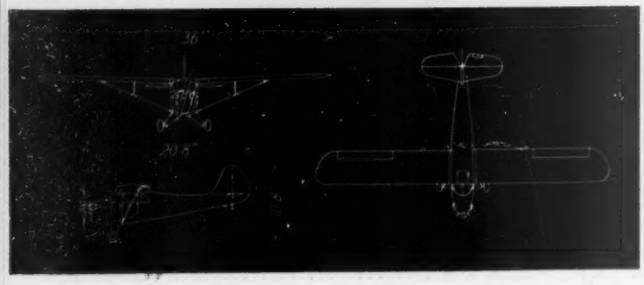
Vultee Division, Aviation Manufacturing Corp., Downey, Calif. . 52
R. W. Millar, Vice Pres. & Gen. Mgr.

Waco Aircraft Co., Troy, Ohio 45, 52
C. J. Bruckner, Pres., A. F. Arcier, Chief Engr., Hugh Perry, Sales Manager.

Waterman Arrowplane Corp., 1560 Fifth St., Santa Monica, Cal. 40
Waldo D. Waterman, Pres., Max B. Harlow, Vice Pres. & Chief Engr.

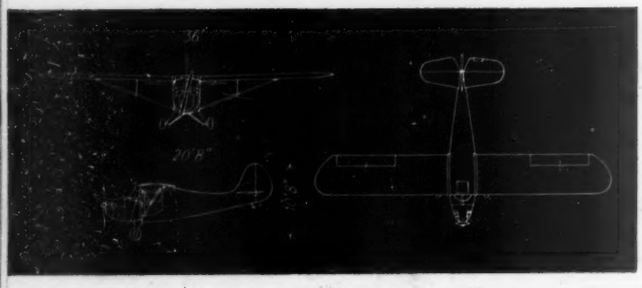
Welch Aircraft Industries, Inc., 1720 Mishawaka Ave., South Bend, Ind. 41
Orin Welch, Pres. & Chief Engr.

AIRPLANES of 1 and 2 SEATS

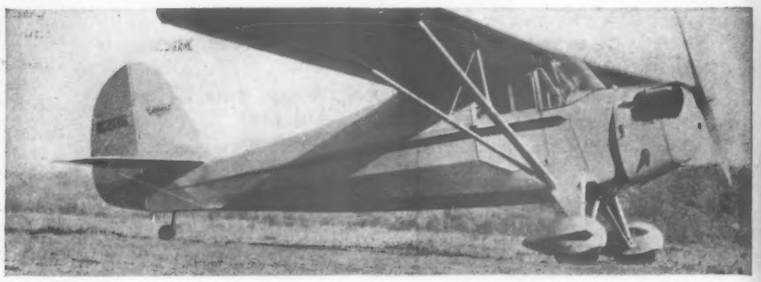


A.T.C. 655

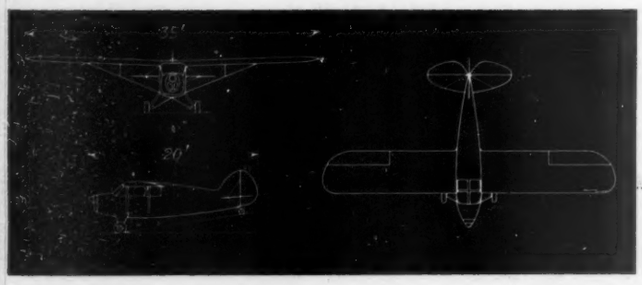
Aeronca KC



A.T.C. 675, 688, 702



Aeronca 50



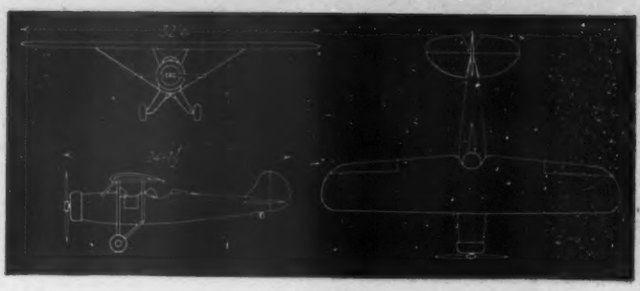
A.T.C. 2-547

Funk Model B. (Akron Aircraft Co.)

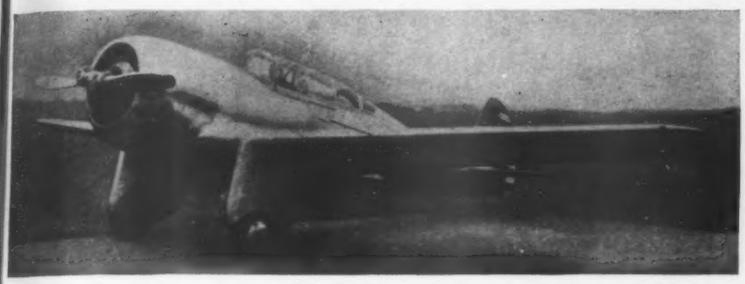
1 and 2 Seats	General					Power Plant							Performance						
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
Abrams Aircraft Corp	*Explorer*	.....	.....	*CML*	...	*Wr.Ww.*	*330*	.....	*120*	*1,200*	.....	.....	*185*	.....	*150*	.....	*60*	*1,300*	*9,000*
Aeronautical Corp. of America	KC	*655	1,590	CML	2	Con.	40	S.L.	10	250	3.0	69	90	S.L.	85	S.L.	35	450	12,000
Aeronautical Corp. of America	50-C	*675	1,795	CML	2	Con.	50	S.L.	12	250	3.5	76	100	S.L.	90	S.L.	35	550	14,000
Aeronautical Corp. of America	50-F	*688	1,695	CML	2	Fr.	50	S.L.	12	250	3.5	72	98	S.L.	88	S.L.	35	500	14,000
Aeronautical Corp. of America	50-L	702	1,795	CML	2	Lyc.	50	S.L.	12	250	3.5	70	99	S.L.	89	SL	35	500	14,000
Aeronautical Corp. of America	*CF*	.....	*1,495*	*CML*	2	*Fr.*	*40*	*S.L.*	*10*	*250*	*3.0*	*69*	*90*	*S.L.*	*85*	*S.L.*	*35*	*450*	*12,000*
Air Transport Mfg. Co., Ltd	P-2	482	.....	OML	2	K	100	S.L.	30	450	7.0	82	130	1,000	105	1,000	40	1,200	14,000
Air Transport Mfg. Co., Ltd	P-2-S	488	.....	OML	2	K	100	S.L.	30	450	7.0	82	135	1,000	110	1,000	42	1,200	14,000
Akron Aircraft Co	Funk B	2-547	1,800	CML	2	Funk	70	S.L.	16	400	4.0	76	112	S.L.	100	S.L.	45	700	16,000
Lawrence W. Brown Aircraft Co	*B-3*	.....	*8,500*	*CML*	2	*Men*	*250*	*5,000*	*58*	*600*	.....	*84*	*205*	*S.L.*	*190*	*S.L.*	.....	*1,200*	*18,000*
Curtiss-Wright Corp.	A 19-R	629	.....	CML	2	WrWw[9]	420	1,400	70	450	29.7	96	209	2,500	191	Crit.	55.4	2,800	23,000
Dart Mfg. Corp	GK	674	3,475	CLM [1]	2	LeB	90	S.L.	25	550	5.4	80	135	S.L.	118	S.L.	40	850	14,850
Dart Mfg. Corp	*GW*	.....	*3,875*	*CLM* [1]	2	*WarRiRm*	*90*	*S.L.*	*25*	*550*	*5.4*	*80*	*135*	*S.L.*	*118*	*S.L.*	*40*	*900*	*15,700*
Dart Mfg. Corp	*U*	.....	†	*CLM* [1]	2	*WarRiRm*	*145*	*S.L.*	*35*	*600*	*9.0*	*84*	*170*	*S.L.*	*155*	*S.L.*	*45*	*1,200*	*20,000*

[1] All models available with open cockpits. Key on page 41. † On request. [9]RiRm

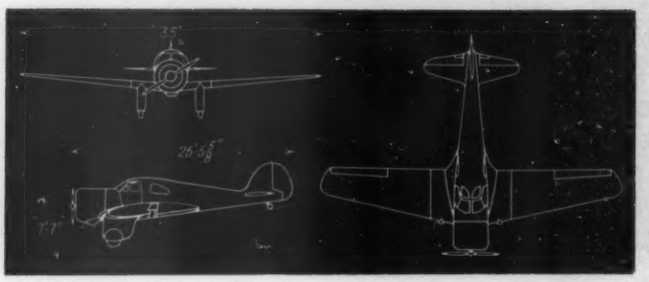
Air Transport P-2, P-2-S



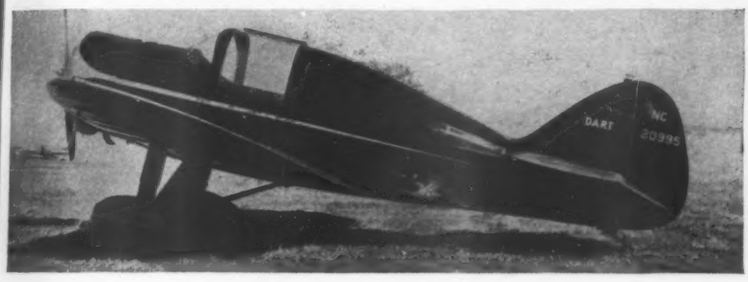
A.T.C. 482, 488



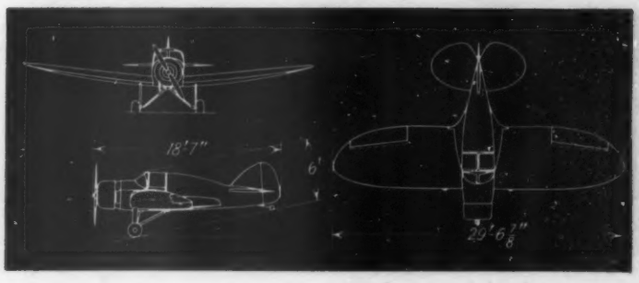
Curtiss-Wright A-19-R



A.T.C. 629



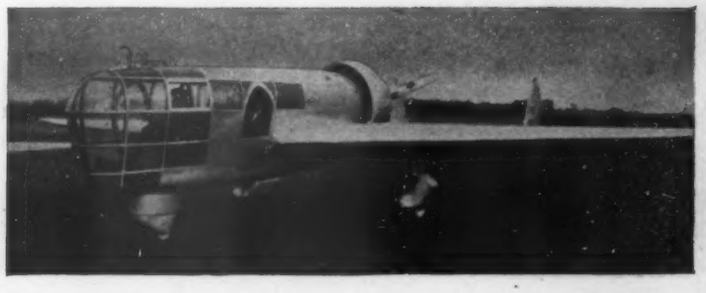
Dart GK



A.T.C. 674

No A.T.C.

Brown B-3



Abrams Explorer

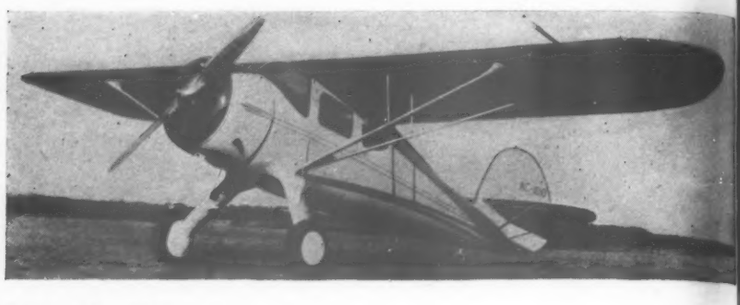
No A.T.C.

Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull†
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
17.8	*10.3*	*2,100*	*3,400*	*36'8"*	*26'6"*	.....	*191.0*	*18.4*	*7.66*	*6.86*	*20.7*	*9.3*	*Mono*	.....	.....	*Ty*	.....	.....	.....	.....	*Sk*	*Wl,ST,D*
7.23	26.	608	1,060	36'	20'8"	6'3"	146.4	17.62	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	GoAw 16x7.3 GoAw 18x8.3	GoDisc GoDisc	Ol	Wh	ST,Wl,Fab
6.68	22.6	669	1,130	36'	21'1"	6'3"	169.0	19.8	6.5	8.2	13.6	11.5	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	ShMech	Ol	SkWh	ST,Wl,Fab
6.68	22.6	663	1,130	36'	21'	6'3"	169.0	19.8	6.5	8.2	13.6	11.5	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	ShMech	Ol	SkWh	ST,Wl,Fab
6.68	22.6	660	1,130	36'	20'8"	6'3"	169.0	19.8	6.5	8.2	13.6	11.5	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	Sh,Mech	Ol	SkWh	ST,Wl,Fab
7.40	*27.0*	*636*	*1,080*	*36'*	*20'10"*	*6'3"*	*146.4*	*19.8*	*6.5*	*8.2*	*13.6*	*11.5*	*Sol,Sp*	*Sp*	*Fab*	*Fx*	*72*	*Sh 6.00x6*	*Sh,Mech*	*Ol*	*SkWh*	*ST,Wl,Fab*
10.12	16.5	1,020	1,650	32'	24'	7'	163.0	16.2	2.5	7.0	17.0	13.5	Sp,Box	W	Fab	Fx	70	Aut 20x9–4	Aut	Sc	Sk	ST,Wl,Fab
10.73	17.5	1,075	1,750	32'	24'	7'	163.0	16.2	2.5	7.0	17.0	13.5	Sp,Box	W	Fab	Fx	70	Aut 20x9–4	Aut	Sc	Wh	ST,Wl,Fab
8.0	21.75	870	1,350	35'	20'	6'	169.0	23.0	5.28	6.16	15.2	10.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17.6	*10.60*	*1,850*	*2,650*	*32'*	*26'*	*8'*	*150.0*	.....	.....	.....	.....	.....	*D,S*	*D*	*AD,Fab*	*Fx*	.....	*Aw 22*	*Go*	.....	*Wh*	*ST,Wl,Fab*
18.36	7.6	2,018	3,200	35'	26'4"	7'6"	174.3	12.0	8.06	7.36	16.98	8.58	D,Mo	D	D,Mo	Fx	83	6.50x10bx	GoHyd	Dl	Wh	D,Mo
10.7	17.2	940	1,550	29'7"	18'7"	6'	145.0	18.8	4.85	5.87	22.05	10.17	Lmd,Sp	W	Fab	Fx	78⅝	Go 18x8–3	GoMchDsc	Ol,Own	Wh	Wl,ST,Fab
10.7	*17.2*	*950*	*1,550*	*29'7"*	*18'8"*	*6'*	*145.0*	*18.8*	*4.85*	*5.87*	*22.05*	*10.17*	*Lmd,Sp*	*W*	*Fab*	*Fx*	*78⅝*	*Go 18x8–3*	*GoMch Disc*	*Ol,Own*	*Wh*	*Wl,ST,Fab*
12.6	12.6	1,057	1,820	29'7"	18'8½"	6'3"	145.0	18.8	4.85	5.87	22.05	10.17	Lmd,Sp	W	Fab	Fx	80	Go 18x8–3Hd	GoHyd Disc	Ol,Own	Wh	Wl,ST,Fab

No A.T.C.

Kellett KD-1A

A.T.C. 552



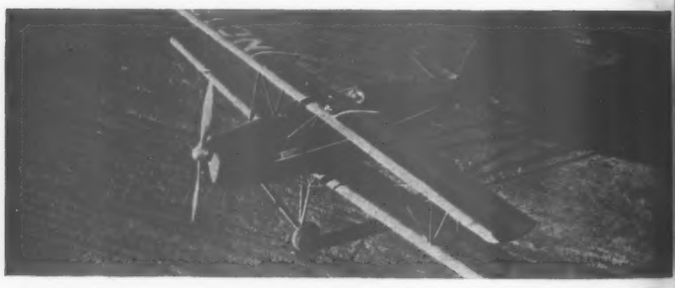
Luscombe Phantom

A.T.C. 687

Luscombe 90

No A.T.C.

Miller Z-1

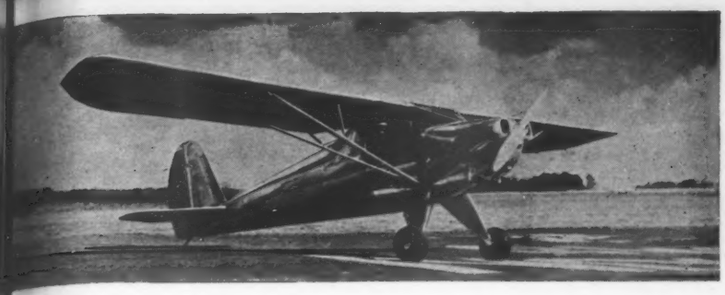


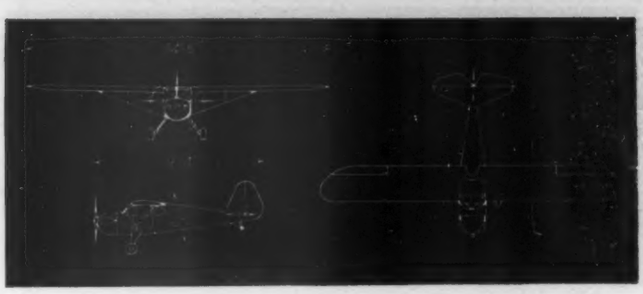
Phillips C.T.-1

No A.T.C.

1 and 2 Seats	General					Power Plant							Performance								
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)
Kellett Autogiro Corp	*KD-1A*			*OLGY*	2	*Ja*	*225*	*S.L.*	*30*	*205*	*14.0*	*102*	*125*	*S.L.*	*100*	*S.L.*	*No*	*1,060*	*14,000*	40.6†	9.98
Kellett Autogiro Corp	*KD-1B*			*CLGY*	1	*Ja*	*225*	*S.L.*	*30*	*208*	*14.0*	*102*	*127*	*S.L.*	*102*	*S.L.*	*No*	*1,060*	*14,000*	40.8†	10.00
Luscombe Airp. Corp	Phantom I	*552	5,975	CML	2	War	145	S.L.	33	560	9.0	88	160	S.L.	144	S.L.	45	1,400	19,500	13.6	13.5
Luscombe Airp. Corp	90	*687	3,975	CML	2	War	90	S.L.	33	630	6	84	130	S.L.	115	S.L.	45	850	15,000	12.3	19.1
Luscombe Airp. Corp	50***	694	.....	CML	2	Con.	50	S.L.	15	380	3.75	76	109	S.L.	96	S.L.	35	750	14,500	8.0	22.2
Miller Aircraft Corp	*Z-1*	.....	.....	*OCLM*	2	*Men B-4*	*95*	*S.L.*	*30*	*555*	*6.0*	*67*	*125*	*S.L.*	*110*	*S.L.*	*45*	*750*	*12,000*	11.25	16.6
Miller Aircraft Corp	*Z-2*	.....	.....	*OCLM*	2	*Men C-4*	*125*	*S.L.*	*36*	*590*	*7.8*	*67*	*155*	*S.L.*	*132*	*S.L.*	*46*	*975*	*15,000*	11.4	12.8
Miller Aircraft Corp	*Z-3*	.....	.....	*OCLM*	2	*Men C-4S*	*150*	*S.L.*	*40*	*600*	*9.3*	*67*	*165*	*S.L.*	*145*	*S.L.*	*46*	*1,130*	*18,000*	11.8	11.0
Monocoupe Corp	*DeLuxe 90-W*	.....	*4,950*	*CML*	2	*War*	*125*	*S.L.*	*28*	*580*	*6.3*	*78*	*150*	*S.L.*	*130*	*6,000*	*40*	*1,300*	*19,000*	12.2	17.9
Monocoupe Corp	DeLuxe 90-A	*306	4,175	CML	2	Lam	90	S.L.	28	600	4.8	78	130	S.L.	110	S.L.	40	900	15,000	12.2	17.9
Monocoupe Corp	110-Special	327	5,600	CML	2	War	145	S.L.	28	530	8.5	78	186	S.L.	162	S.L.	55	2,100	23,800	17.4	11.3
Phillips Aviation Co	1-B	693	5,800	CML	2	Men	125	S.L.	43	720	8.5	84	140	S.L.	130	8,000	49	710	13,500	13.0	17.6
Phillips Aviation Co	*CT-1***	.....	*3,500*	*CBL*	2	*Men.*	*95*	*S.L.*	*26*	*400*	*6.4*	*94*	*117*	*S.L.*	*102*	*5,000*	*41*	*960*	*16,000*	.....	.....

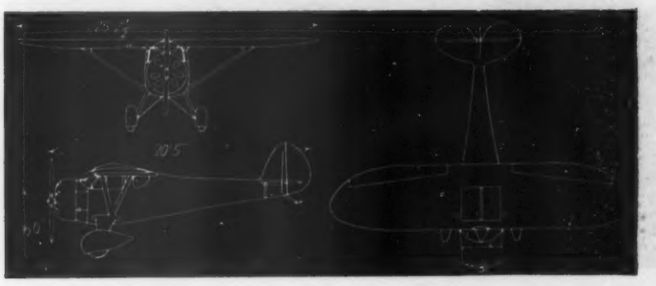
† Blade loading. ‡ Blade area. †† Goodyear 18x8-3 wheels and brakes optional *** Approved for skis. ** CT-1 Civilian Trainer also available with 125 h.p. Menasco — wood



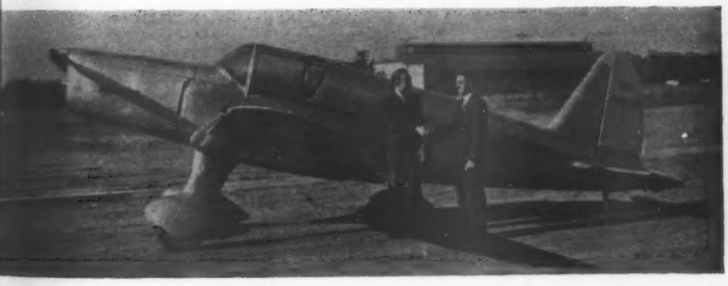


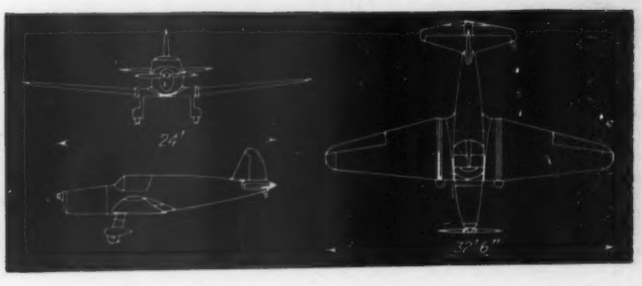
Luscombe 50 **A.T.C. 694**

Monocoupe 90A **A.T.C. 306**



Monocoupe 110 Special **A.T.C. 327**



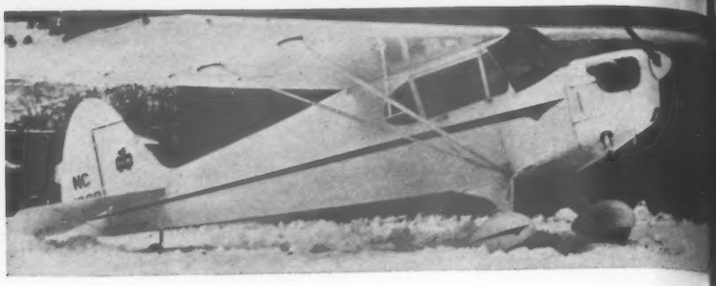


Phillips 1-B **A.T.C. 693**

Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear							Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
10.6†	9.98	1,600	2,245	40′	28′10″	10′3″	55.2‡‡	.....	12.0	3.2	22.0	.....	ST	Ply	Pl,Fab	Fx	114.5	7.00x5 Gr	Mech,Ha	Ot,Bx	Wh	ST,Wl,Fab
10.8†	10.00	1,630	2,250	40′	28′10″	10′3″	55.2‡‡	.....	12.0	3.2	22.0	.....	ST	Ply	Pl,Fab	Fx	114.5	7.00x5 Gr	Mech,Ha	Ot,Bx	Wh	ST,Wl,Fab
13.6	13.5	1,320	1,950	31′	21′	8′6″	143.0	13.4	7.02	7.29	12.85	9.05	DI	AD	Fab	Fx	72	War 650x10	WarMech	Oi	OlWh	AD,Mo
12.3	19.1	1,100	1,725	32′	20′11″	6′6″	140.0	12.3	4.9	6.66	13.0	8.75	DI	AD	Fab	C	91¾	Gr 18x8-3	Gr,Mech	Oi(own)	OlWh	AD,Mo
8.0	22.2	630	1,200	34′6″	19′4″	5′7½″	138.5	12.4	4.9	6.66	13.0	8.75	DI	Al,T	Fab	SC	72	Gr 16x7-3	††	Oi(own)	Spr	AD,Mo
11.25	16.6	1,020	1,700	30′	21′8″	6′8″	140.0	10.6	4.3	6.5	12.4	7.62	Sp	Sp	Fab	....	80	Gr,Ha8.00-5	Mech	Own	Sk	T
11.4	12.8	1,030	1,700	30′	21′8″	6′8″	140.0	10.6	4.3	6.5	12.4	7.62	Sp	Sp	Fab	....	80	Gr,Ha8.00-5	Mech	Own	Sk	T
11.8	11.0	1,100	1,700	30′	21′8″	6′8″	140.0	10.6	4.3	6.5	12.4	7.62	Sp	Sp	Fab	....	80	Gr,Ha8.00-5	Mech	Own	Sk	T
12.2	17.9	1,100	1,700	30′	21′8″	6′8″	140.0	10.6	4.3	6.5	12.4	7.62	Sp	Sp	Fab	....	80	Gr,Ha8.00-5	Mech	Own	Sk	T
12.2	17.9	1,020	1,610	32′	20′6″	6′11″	132.2	13.5	4.1	5.8	10.6	9.2	Sol,Sp	W	Fab	Fx	87.5	GoAirWheels	Go	Sc	Wh	ST,Wl,Fab
12.2	17.9	973	1,610	32′	20′6″	6′11″	132.2	13.5	4.1	5.8	10.6	9.2	Sol,Sp	W	Fab	Fx	87.5	EH 6.50x10†	EHMech†	Sc	Wh	ST,Wl,Fab
17.4	11.3	1,045	1,630	23′2½″	20′5″	6′6″	94.0	16.0	3.5	5.0	10.0	7.0	Sol,Sp	W	Fab	Fx	75	EH 6.50x10	EHMech	Sc	Wh	ST,Wl,Fab
13.0	17.6	1,475	2,170	32′6″	24′	7′8″	168.0	.....	.....	.....	.....	.....	AD	AD	AD	Fx	80	Aut 6.50-10	HcHyd	Air-kl	Pn	Stiff,Skin
.....	.....	941.5	1,604	28′3″	23′	8′3″	95.8	Upper	.....	.....	.....	.....	Sp	Me	Fab	Fx	.....	Go	Ha	.....	Pn	Fab,Wl,S Tube
				27′1″			89.8	Lower											Go			
																			ToeMech			

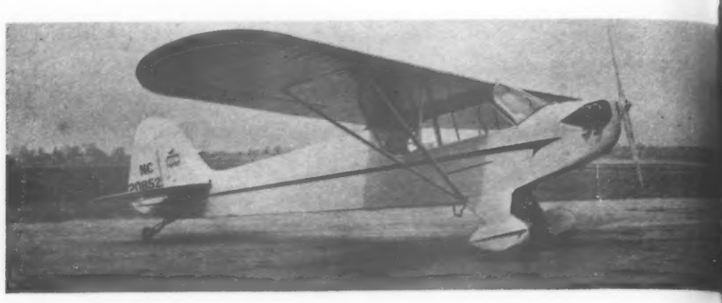
† adjustable pitch propeller. Key on page 41.

A.T.C. 703

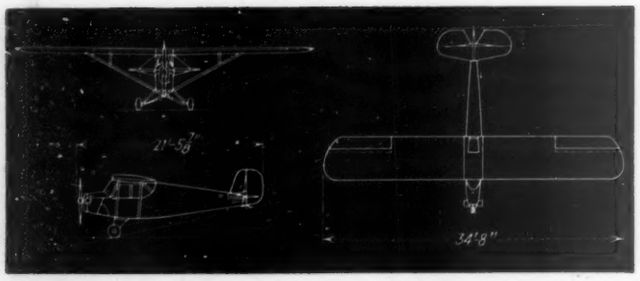


Piper Cub Coupe

A.T.C. 660, 691, 692, 695, 698

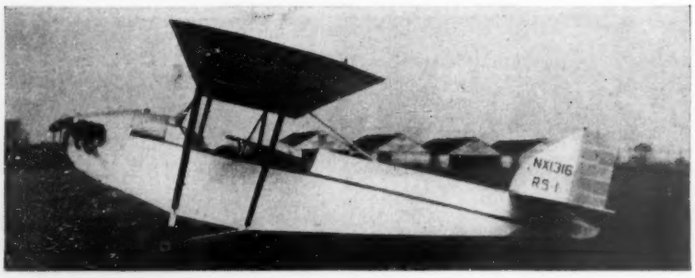


Piper Cub J-3



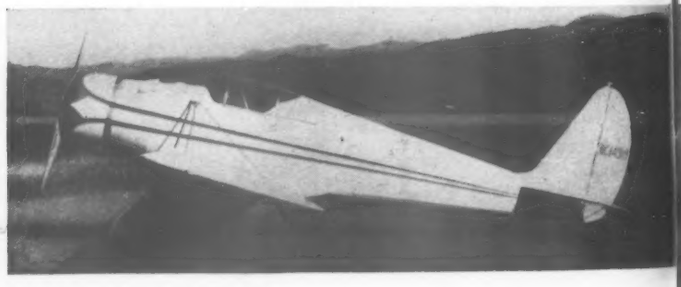
A.T.C. 530

Porterfield Zephyr



No A.T.C. (Specifications., Pages 40, 41)

Ross R.S.-1

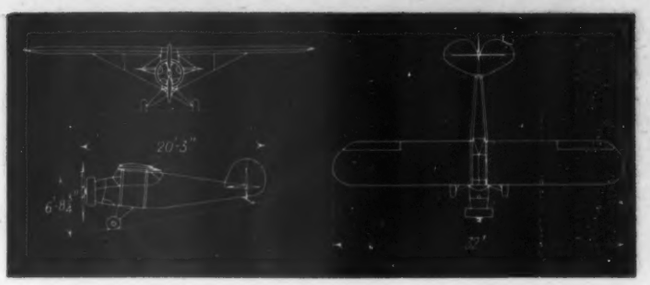


Pasped Skylark W-1

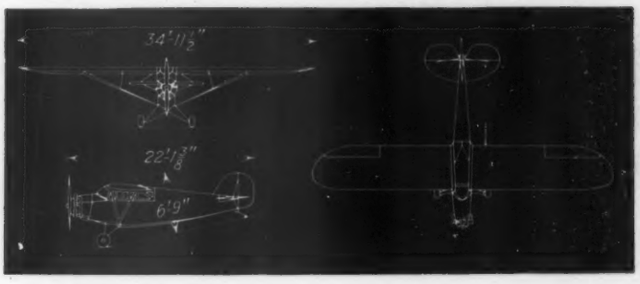
No A.T.C.

1 and 2 Seats	General					Power Plant						Performance							We	
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)
Pasped Aircraft Corp	*Skylark W-1*	.....	.....	*OCML*	*2*	*War*	*125*	*S.L.*	*31*	*545*	*6.0*	*96*	*139*	*S.L.*	*117*	*S.L.*	*35*	*800*	*19,000*	*10*	*15*
Piper Aircraft Corp.[4, 2, 1]	J-3 Cub Trainer	*660	1,249	CML	2	A-40-4,5)	40	S.L.	9	200	3.0	69	85	S.L.	70	S.L.	38	400	10,000	5.6	25
Piper Aircraft Corp.[4, 2]	J-3 Cub Sport	*691	1,395	CML	2	(Con.A-40 (40-4, 5)	40	S. L.	12	280	3.0	69	85	S.L.	70	S.L.	39	400	10,000	5.87	25
Piper Aircraft Corp.[4, 2]	J-3C-50 Cub Sport	*691	1,636	CML	2	Con. A-40 (50-1 or 3)	50	S.L.	12	250	3.6	76	91	S.L.	80	S.L.	40	650	12,000	6.18	22
Piper Aircraft Corp.[4, 2]	J3F-50 Cub Sport	*692	1,499	CML	2	Con. A-50 FrAC-1-50	50	S.L.	12	260	3.5	70	89	S.L.	79	S.L.	40	600	12,000	6.18	22
Piper Aircraft Corp.[4, 2]	J3P Cub Sport	695	1,718	CML	2	Len AR-3	50	S.L.	12	260	3.5	72	92	S.L.	81	S.L.	40	700	12,000	6.18	22
Piper Aircraft Corp.[4, 2]	J3L Cub Sport	698	1,617	CML	2	Ly O-145	50	S.L.	12	260	3.5	70	.....	S.L.	.....	S.L.	40	.....	12,000	6.18	22
Piper Aircraft Corp.[4]	J4 Cub Coupe	703	1,995	CML	2	(Series1,3) Con. A-50	50	S.L.	16	340	3.6	76	93	S.L.	83	S.L.	4?	500	12,000	6.56	24
Porterfield Aircraft Corp	90	611	.....	CML	2	War	90	.....	18	.....	.....	.....	121	.....	112	.....	40	.....	20,000	9.02	14
Porterfield Aircraft Corp	70	567	.....	CML	2	LeB	70	.....	18	.....	.....	.....	115	.....	105	.....	40	.....	17,000	8.91	18
Porterfield Aircraft Corp	Zephyr	530	.....	CML	2	Con	40	.....	9	.....	.....	.....	85	.....	75	.....	30	.....	10,000	2.60	6
Rearwin Airplanes	Sportster 7000	*574	2,195	CML	2	K-R	70	S.L.	24	500	4.8	76	115	800	103	800	38	670	13,000	8.8	20
Rearwin Airplanes	Sportster 9000L	*591	2,895	CML	2	K-R	90	S.L.	24	500	5.0	76	123	800	110	800	38	1,000	15,000	8.8	16

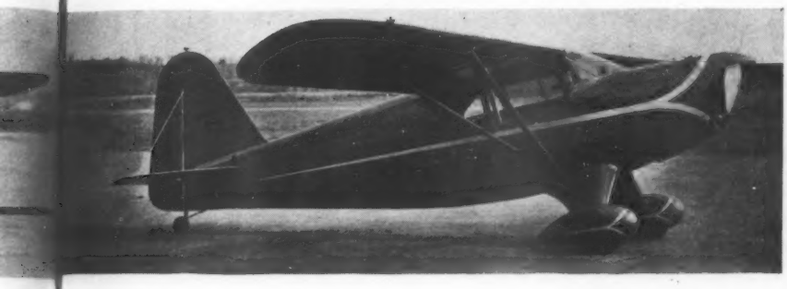
[1] Steerable wheel available. [2] May be equipped with Piper S-1000 skis. [3] Hydraulic brakes available on order. [4] Radio installation available. [5] Metal covered to rear of cabin — Fabric cov

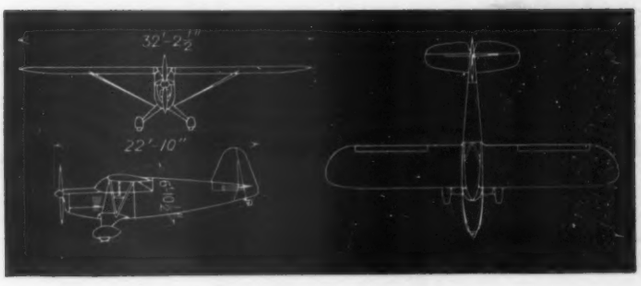


Porterfield 90-70 **A.T.C. 611, 567**

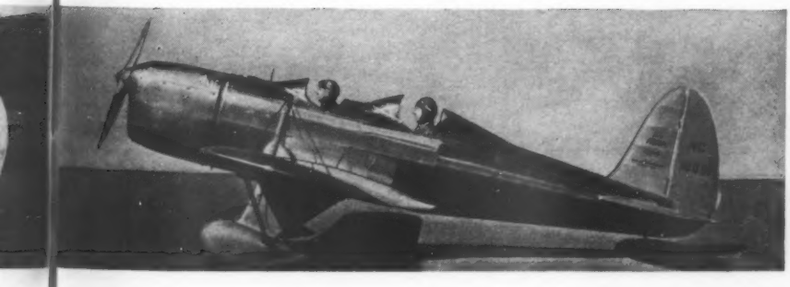


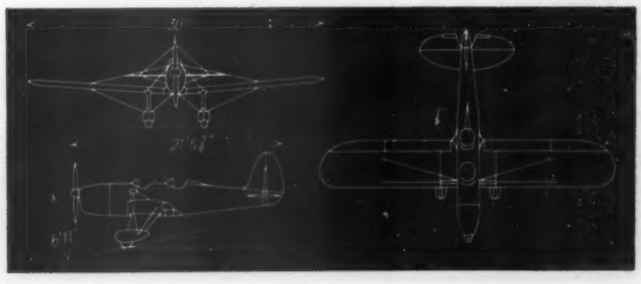
Rearwin Sportster **A.T.C. 574, 591, 624**





Rearwin Speedster **A.T.C. 661 (Specifications, Pages 40, 41)**



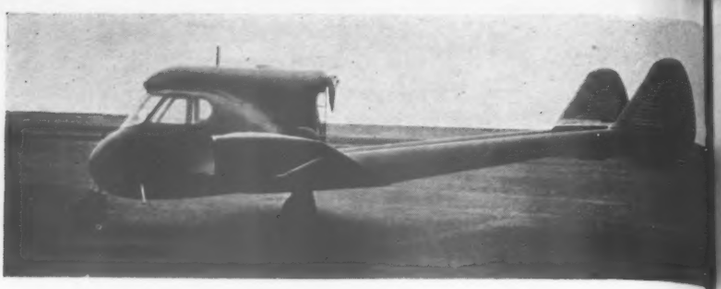


Ryan ST-A **A.T.C. 571, 681 (Specifications, Pages 40, 41)**

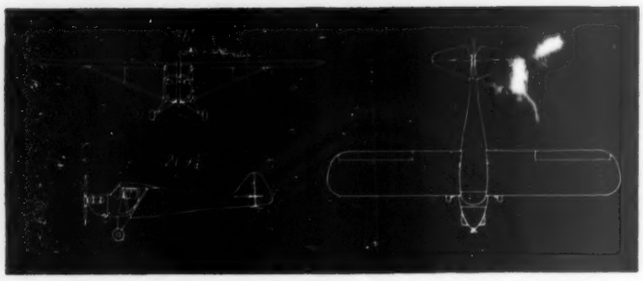
Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
10	*15.2*	*1,300*	*1,900*	*35'10"*	*25'0"*	*7'8"*	*187.0*	*19.6*	*7.6*	*7.2*	*19.2*	*13.6*	*Lmd,Sp*	*Sp*	*Fab*[5]	*Fx*	*96*	*Aut 10x6.5*	*Aut*	*Ol, Pas*	*Wh*	*ST,Wl,Fab,D*
5.6	25.0	574	1,000	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[3]	Ru	Sk[1]	ST,Wl,Fab
5.87	25.6	580	1,025	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[3]	Ru	Sk[1]	ST,Wl,Fab
6.18	22.0	600	1,100	35'2½"	22'6½"	6'8"	178.5	19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[3]	Ru	Sk[1]	ST,Wl,Fab
6.18	22.0	590	1,100	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[3]	Ru	Sk[1]	ST,Wl,Fab
6.18	22.0	590	1,100	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[3]	Ru	Sk[1]	ST,Wl,Fab
6.18	22.0	590	1,100	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[3]	Ru	Sk[1]	ST,Wl,Fab
6.56	24.0	710	1,200	36'2"	22'6"	6'10"	183	19.2	4.66	6.76	14.66	10.64	Sol,Sp	Niorl	Fab	Fx	77	Ha 8.00x4	Hyd,Pal	Ol	FuSw Wh	ST,Wl,Fab
9.02	14.7	826	1,326	32'	20'1⅛"	6'8¾"	147.0	17.6	5.16	6.13	13.2	9.55	Sp	Sp	Fab	Fx	69¼	.....	.....	.....	Wh	Wl,ST,Fab
8.91	18.7	813	1,310	32'	20'1⅛"	6'8¾"	147.0	17.6	5.16	6.13	13.2	9.55	Sp	Sp	Fab	Fx	69¼	.....	.....	.....	Wh	Wl,ST,Fab
2.60	6.15	588	1,040	34'8"	21'5⅞"	6'11¼"	169.0	10.3	4.75	6.7	10.06	10.92	Sp	Sp	Fab	Fx	65	.....	.....	.....	Wh	Wl,ST,Fab
8.8	20.8	853	1,460	35'	22'3"	6'9"	166.0	19.75	5.17	6.92	15.04	12.12	Sol,Sp	Sp	Fab	Fx	72	Go 18x8-3	Go,Mech[2]	Hyd	Sk	ST,Wl,Fab
8.8	16.2	830	1,460	35'	22'3"	6'9"	166.0	19.75	5.17	6.92	15.04	12.12	Sol,Sp	Sp	Fab	Fx	72	Go 18x8-3	Go,Mech[2]	Hyd	Sk	ST,Wl,Fab

[1] Fabric covered balance of Fuselage. Key:— See page 41.

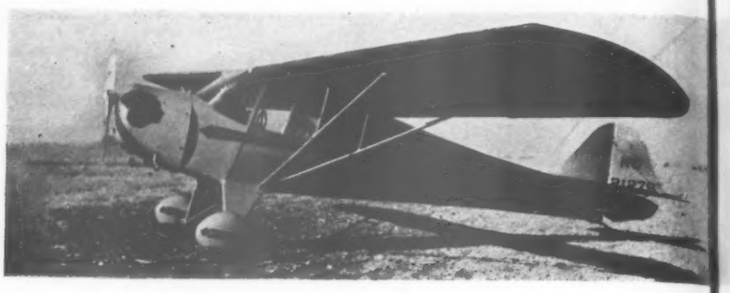
A.T.C. 644



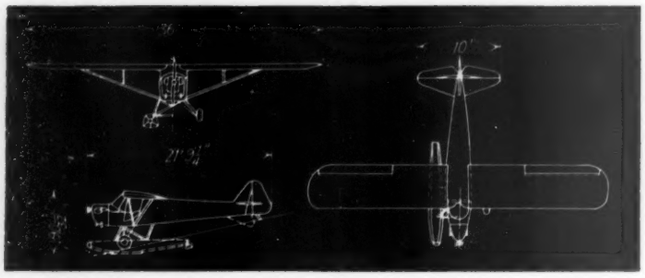
Stearman-Hammond Y-1S



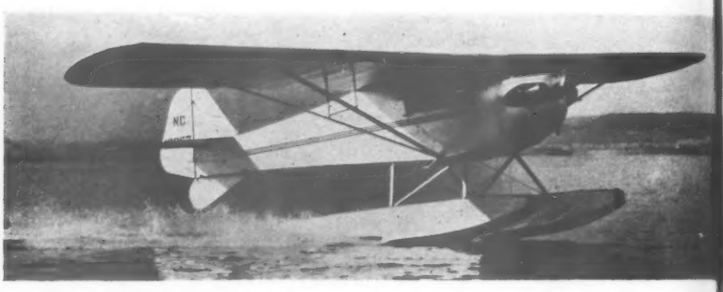
A.T.C. 696, 699, 700



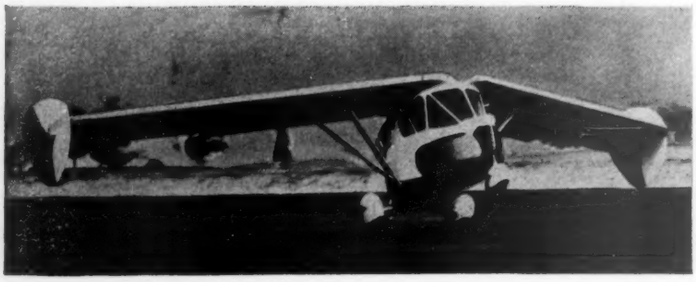
Taylorcraft Model-B



A.T.C. 643

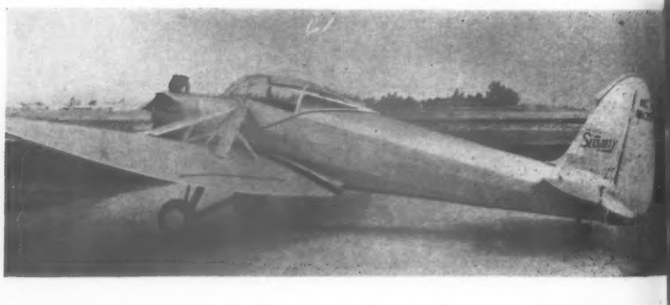


Taylorcraft Model-A



No A.T.C.

Arrowbile 5



Security S-1B

No A.T.C.

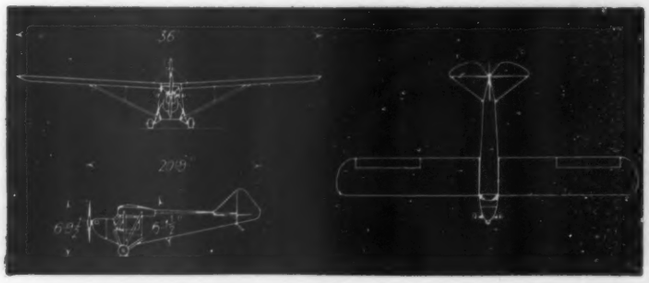
1 and 2 Seats	General					Power Plant							Performance						
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
Rearwin Airplanes	Sportster 9000	*624	(♦)	CML	2	War	90	S.L.	24	450	5.7	76	123	800	110	800	38	1,000	15,000
Rearwin Airplanes	Speedster 6000M	661	4,390	CML	2	Men	125	S.L.	34	550	8.0	76	150	800	130	800	48	1,300	18,000
Rearwin Airplanes	*Model 8090*			*CML*	2	*K-R*	*90*	*S.L.*	*34*	*650*	*5.0*	*84*	*130*	*800*	110	*800*	*48*	*750*	*14,000*
Rearwin Airplanes	*Model 8125*			*CML*	2	*K-R*	*120*	*S.L.*	*34*	*625*	*7.0*	*84*	*150*	*800*	*125*	*800*	*48*	*1,000*	*17,000*
Orrin E. Ross	*RS-1*			*OML*	2	*Con*	*40*		*9*	*240*	*2.8*	*69*	*90*		*75*		*40*		*9,000*
Ryan Aeronautical Co	ST-A	571		OML	2	Men	125	S.L.	24	360	8.5	78	150	S.L.	127	S.L.	42	1,200	17,500
Ryan Aeronautical Co	ST-A Special	681		OML	1–2	Men	150	3,000	24	330	9.8	77	160	S.L.	135	S.L.	42	1,400	21,000
Security Aircraft Corp	*S-1B*		*2,995*	*CML*	2	*Se*	*125*	*S.L.*	*23.5*	*300*	*7*	*100*	*120*	*S.L.*	*100*	*S.L.*	*35*	*1,200*	*18,000*
Stearman-Hammond Airc. Corp.	Y-1S	644	7,150	CML	2	Men	150	3,000	43	570	8.5	80	125	3,000	113	3,000	39	725	17,000
Taylor-Young Airplane Co	Taylorcraft Model A	*643	1,565	CML	2	Con	40	S.L.	10	230	3.0	.....	91	S.L.	80	S.L.	35	390	14,000
Taylor-Young Airplane Co	Model BL	*700	1,695	LCM	2	Ly	50	S.L.	12	270	3.5	.....	97	S.L.	88	S.L.	38	450	13,000
Taylor-Young Airplane Co	Model BC	696	1,765	LCM	2	Con	50	S.L.	12	270	3.5	.....	97	S.L.	88	S.L.	38	450	13,000
Taylor-Young Airplane Co	Model BF	699	1,665	LCM	2	Fr	50	S.L.	12	270	3.5	.....	97	S.L.	88	S.L.	48	450	13,000
Waterman Arrowplane Corp	*Arrowbile 5*		.....	*CML*	2	*Stu*	*100*	*S.L.*	*24*	*375*	*6.72*	*96*	*120*	*S.L.*	*105*	*S.L.*	*48*	*650*	*15,000*
Welch Airc. Industries, Inc	OW5M	637	996	CML	2	Con	40	S.L.	9	250	3	66	93	S.L.	85	S.L.	32	460	12,000
Welch Airc. Industries, Inc	OW6M	636	996	CML	2	Aer	36	S.L.	9	250	3	66	93	S.L.	85	S.L.	31	475	12,500
Welch Airc. Industries, Inc	*OW7M*	.....	996	*CML*	2	*Welch 0-2*	*45*	*S.L.*	*9*	*250*	*3.1*	*70*	*96*	*S.L.*	*88*	*S.L.*	*29*	*550*	*13,500*

♦ Price on request.

Key:—See page 41.

Key to Abbreviations Used in All Specification Tables

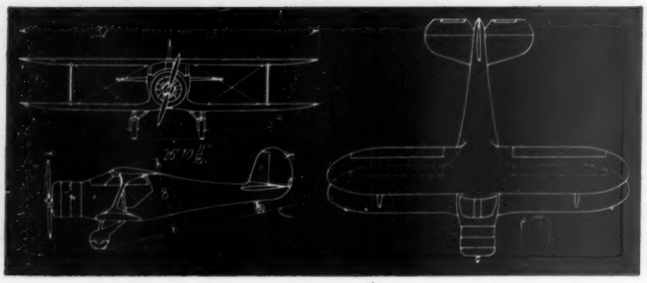
*	— Approved on floats
A	— Amphibian
Acp	— Aircraft Prod
AD	— Alclad
Aer	— Aerol
Al	— Aluminum
Aln	— Allison
Apl	— Applied for
Ar-	— Aeronca
Aut	— Autofan
Aw	— Air Wheels
B	— Biplane
Bo	— Bolted
Box	— Box spar
Bx	— Bendix
C	— Closed
CG	— Coast Guard
Con	— Continental
Crit	— Critical
Cy	— Cyclone
Cyy	— Two row Cyclone
D	— Aluminum Alloy
E.H.	— Ebert Hatch
F	— Flying Boat
Fab	— Fabric
Fl	— Floats
Fo	— Ford
Fr	— Franklin
Fx	— Fixed
G	— Glued
Gen	— General
Go	— Goodyear
Gr	— Goodrich
Gy	— Autogiro
Ha	— Hayes
Hyd	— Hydraulic
I	— "I" section
Id	— Inverted
Ja	— Jacobs
K	— Kinner
Kr	— Ken Royce
L	— Landplane
Lam	— Lambert
LeB	— LeBlond
Len	— Lenape
Lmd	— Laminated
Lp	— Low Pressure
Ly	— Lycoming
M	— Monoplane
Me	— Metal
Mech	— Mechanical
Men	— Menasco
Mil	— Military
Mo	— Monocoque
Mu	— Multicellular
O	— Open
Ol	— Oleo
Op	— Optional
Pal	— Palmer
Ply	— Plywood
Pn	— Pneumatic
Pob	— Pobjoy
Pwh	— P & W Hornet
Pwj	— P & W Wasp, Jr.
Pwwj	— P & W Twin Wasp, Jr.
Pww	— P & W Wasp
Pwww	— P & W Twin Wasp
Q	— Sesquiplane
Ran	— Ranger
Re	— Retractable
Ri	— Lord Instrument Mounting
Rm	— Lord Engine Mounting
RW	— Retractable Wheel
Ro	— Routed
Ru	— Rusco
Rv	— Riveted
S	— Steel
Sc	— Shock cord
Se	— Security
Sk	— Skid
Sl	— Streamline
S.L.	— Sea Level
Sh	— Shinn
S.M.B.	— Single metal box
Sol	— Solid
Sp	— Spruce
Spr	— Spring
SS	— Stainless Steel
Stu	— Studebaker
Sz	— Szekly
T	— Tubing
Trs	— Truss
Ty	— Trcycle
W	— Wood
War	— Warner
Wel	— Welch
Wh	— Wheel
Wl	— Welded
Wr	— Wright
Ww	— Whirlwind



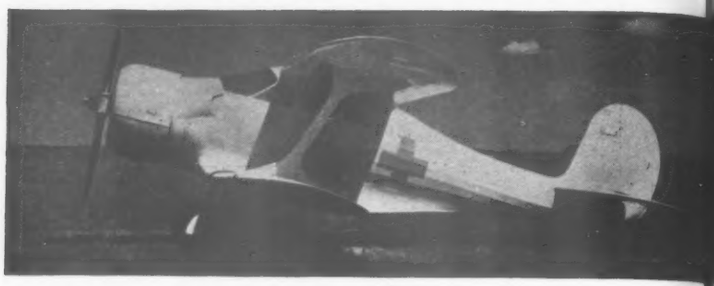
Welch OW **A.T.C. 637, 636**

Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
8.8	16.2	861	1,460	35′	22′3″	6′9″	166.0	19.75	5.17	6.92	15.04	12.12	Sol,Sp	Sp	Fab	Fx	72	Go 18x8-3	Go,Mech	Hyd	Sk	ST,Wl,Fab
11.88	13.6	1,070	1,700	32′	22′10″	6′10.5″	143.2	13.13	10.3	6.0	15.68	9.8	Sol,Sp	Sp	Fab	Fx	72	Go 18x8-3	Go,Mech	Sc	Wh	ST,Wl,Fab
11.125	*20.0*	*1,020*	*18,000*	*34′1¾″*	*21′6″*	*7′4″*	*161.8*	*13.13*	*5.31*	*6.98*	*13.94*	*11.56*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*80*	*Go 18z8-3*	*Go,Mech*	*Hyd*	*Wh*	*ST,Wl,Fab*
11.125	*15.0*	*1,040*	*18,000*	*34′1¾″*	*21′6″*	*7′4″*	*161.8*	*13.13*	*5.31*	*6.98*	*13.94*	*11.56*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*80*	*Go 18z8-3*	*Go,Mech*	*Hyd*	*Wh*	*ST,Wl,Fab*
6.4	*23.5*	*518*	*940*	*30′*	*20′*	*7′*	*147*	*13.5*	*3.85*	*5.67*	*15.12*	*10.32*	*Sp*	*Sp*	*Fab*	*Fz*	.....	*16x7-3 or 7-4*	.....	*AirWhl*	*Sk*	*Wl,ST,Fab*
12.9	12.9	1,023	1,600	29′11″	21′5⅜″	6′11″	124.0	12.0	4.5	7.2	12.0	10.0	Sol,Sp	D	Fab	Fx	66	Go 18x8-3	Go,Mech	Ol	Wh	D,Mo
12.9	12.9	1,046	1,600	29′11″	21′5⅜″	6′11″	124.0	12.0	4.5	7.2	12.0	10.0	Sol,Sp	D	Fab	Fx	66	Go 18x8-3	Go,Mech	Ol	Wh	D,Mo
6.75	*14.2*	*1,250*	*1,900*	*40′*	*23′10″*	*7′0″*	*240.0*	.....	.....	.....	.....	.....	*Sp,Ro*	*Sp*	*Fab*	*Fz*	.....	*Go 6.50x10*	*Aut*	*Se*	*Wh*	*ST,Wl,Fab*
10.7	15.0	1,475	2,250	40′	26′10¾″	7′10¹¹⁄₁₆″	210.0	14.25	25.25	.....	22.45	14.9	D	D	Fab	Fx	109	Sl 21	Hyd,Ha	Ol,War	...	AD,Rv,AD
6.20	26.20	586	1,050	36′	22′0″	6′8″	169.0	.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	Fx	.....	.....	.....	Se	Sk	ST,Wl,Fab
6.54	22.00	632	1,100	36′	22′	6′8″	169	.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	Fx	.....	.....	.....	Se	Wh	ST,Wl,Fab
6.54	22.00	632	1,100	36′	22′	6′8″	169	.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	Fx	.....	.....	.....	Se	Wh	ST,Wl,Fab
6.54	22.00	632	1,100	36′	22′	6′8″	169	.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	Fx	.....	.....	.....	Se	Wh	ST,Wl,Fab
10.37	*25.0*	*1,941*	*2,500*	*38′*	*19′4″*	*8′8″*	*241.0*	*32.3*	*31.1*	*21.16*	.....	*32.3*	*Sol,Sp*	*Me*	*Fab*	*Ty*	*70*	*W-100 21x45*	*Bz*	*Ol*	*Wh*	*ST,Wl,Me*
6.6	25.7	528	950	34′4″	20′6″	7′	138.0	18.92	11.2	9.13	14.4	11.2	Sp,I	Base-	Fab	Fx	56½	Welch 16x7	None	Solid	Wh	ST,Wl,Fab
6.7	26.0	498	954	34′4″	21′1″	7′	138.0	18.92	11.2	9.13	14.4	11.2	Sp,I	Base-	Fab	Fx	56½	Welch 16x7	None	Solid	Wh	ST,Wl,Fab
5.99	*20.0*	*500*	*900*	*36′*	*20′9″*	*7′*	*150.0*	*18.92*	*11.2*	*9.13*	*14.4*	*11.2*	*Sp,I*	*Base-*	*Fab*	*Fz*	*56½*	*Welch 16x7*	*None*	*Solid*	*Steer-*	*ST,Wl,Fab*

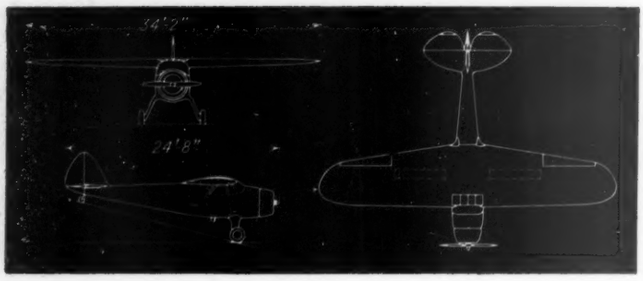
AIRPLANES of 3-5 SEATS



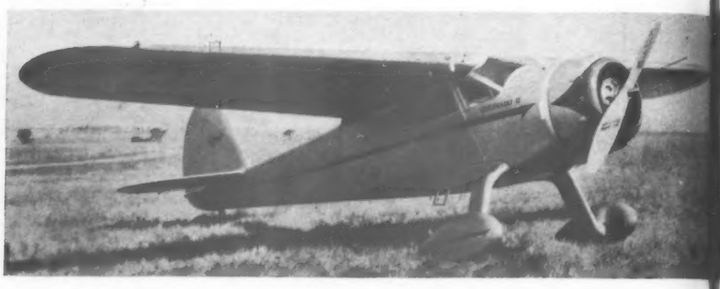
A.T.C. 638, 649, 641, 689



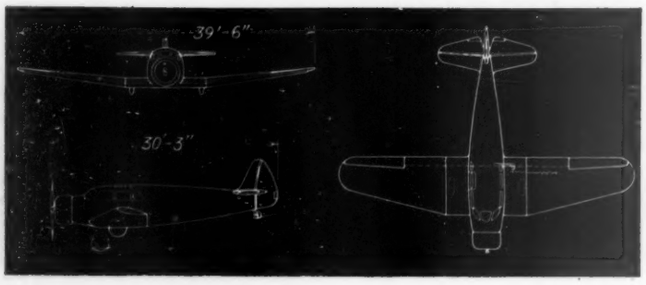
Beech D-17R - D-17S - E-17B - F-17D



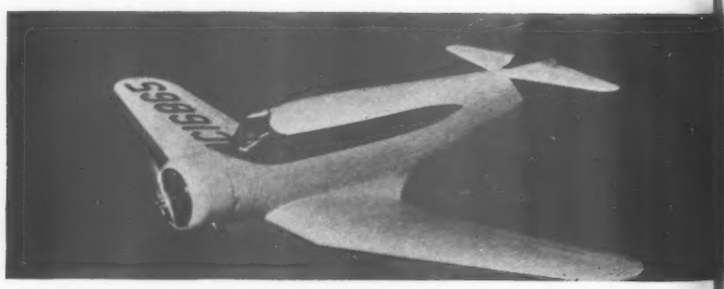
A.T.C. 701



Cessna C-145



A.T.C. 603

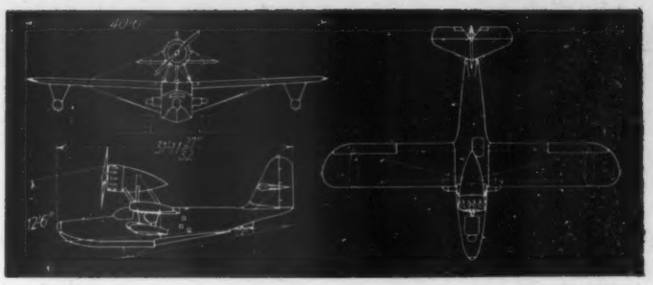


Fairchild F-45

3 to 5 Seats	General					Power Plant						Performance							
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)
Beech Aircraft Corp.	D17R	638	16,990	CBL	5	Wr, Ww, Rm, Ri	450	S.L.	100	815	23.0	99	211	S.L.	202	9,000	50	1,600	14.2	10.0
Beech Aircraft Corp.	D17S	*649	17,790	CBL	5	Pwj,[9]	450	S.L.	100	815	23.0	99	211	S.L.	204	10,000	50	1,600	14.2	10.5
Beech Aircraft Corp.	E17B	*641	10,990	CBL	5	Ja, [9]	285	S.L.	77	725	17.0	93	185	S.L.	177	7,200	45	1,200	11.3	11.7
Beech Aircraft Corp.	F17D	*689	11,790	CBL	5	Ja, [9]	330	3,700	77	725	17.5	93	190	S.L.	177	7,200	45	1,300	11.9	10.7
Bellanca	*14-9*			*CML*	3	*LeB*	*90*		*22*	*500*	*5*	*74*	*132*		*120*		*45*	*800*	*11.75*	*18.3*
Bellanca	*14-7*			*CML*	3	*LeB*	*70*		*22*	*500*	*5*	*72*	*115*		*105*		*45*	*700*	*11.75*	*23.5*
Cessna Aircraft Co.	C-145	701		CML [1]	4	War, Ri	145	S.L.	35 [2]	525	9.5	84	162	S.L.	151	8,200	49	1,000	13.0	16.2
Fairchild Aircraft Corp.	F-45	603		CML	5	WW	350	S.L.	90	785	20.0	102	170	S.L.	165	5,000	57	1,100	16.1	12.5
Fairchild Aircraft Corp.	*F-24 W-9 Standard*	*	*6,190*	*CML*	4	*War, [9]*	*145*	*S.L.*	*40*	*520*	*9.5*	*86*	*138*	*S.L.*	*124*	*7,000*	*53*	*750*	*13.1*	*17.6*
Fairchild Aircraft Corp.	*F-24 W-9 Deluxe*	*	*6,890*	*CML*	4	*War, [9]*	*145*	*S.L.*	*40*	*515*	*9.5*	*86*	*136*	*S.L.*	*122*	*7,000*	*50*	*720*	*13.1*	*17.6*
Fairchild Aircraft Corp.	*F-24 R-9 Standard*	*	*6,530*	*CML*	4	*Ran*	*165*	*S.L.*	*40*	*530*	*10.0*	*86*	.....	*S.L.*	*134*	*7,000*	*53*	*760*	*13.1*	*17.0*
Fairchild Aircraft Corp.	*F-24 R-9 Deluxe*	*	*7,230*	*CML*	4	*Ran*	*165*	*S.L.*	*40*	*520*	*10.0*	*86*	.....	*S.L.*	*132*	*7,000*	*50*	*730*	*13.1*	*17.0*
Fleetwings, Inc.	*F-5*			*CMA*	4	*Ja, [9]*	*285*	*S.L.*	*70*	*560*	*18.0*	*102*	*160*	*S.L.*	*144*	*S.L.*	*61*	*950*	*14.7*	*12.1*
Fleetwings, Inc.	F-501	680	.....	.....	...	.....	300	.....	.....	516	.....	.....	150	.....	135	.....	58	914	15.96	12.5
Fleetwings, Inc.	F-501[4]		.....	.....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	139	6,000	59	1,078	16.	12.6
Gwinn Aircar Co., Inc.	Aircar Model One	682	.....	CBL	2-3	Pob-II	90	S.L.	25	525	5.0	84	120	S.L.	105	S.L.	41 [5]	.....	10.0	18.9
Gwinn Aircar Co., Inc.	*Aircar Model Two*		.....	*CBL*	*2-3*	*Pob V*	*130*	*S.L.*	*25*	*500*	*6.0*	*84*	*137*	*S.L.*	*120*	*S.L.*	*41 [5]*	.....	*10.0*	*13.1*
Howard Aircraft Corp.	DGA-8	*612	14,850	CML	4	WrWw, Rm, Ri	320	S.L.	97	1,085	16.7	99	185	S.L.	167	12,000	53	1,800	20.48	11.8
Howard Aircraft Corp.	*DGA-11*		*17,685*	*CML*	4	*Pwj, [9]*	*450*	*S.L.*	*97*	*850*	*23.0*	*99*	*195*	*S.L.*	*201*	*9,600*	*55*	*2,200*	*22.15*	*9.1*
Howard Aircraft Corp.	*DGA-12*		*11,880*	*CML*	4	*Ja, [9]*	*300*	*S.L.*	*97*	*1,085*	*16.2*	*99*	*184*	*S.L.*	*184*	*7,000*	*53*	*1,550*	*18.1*	*12.6*

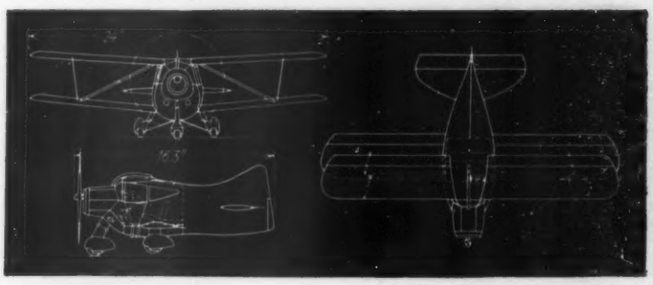
[1] Also as photographic plane, or with floats or skis. [2] Also available with 45-gal. and 52½-gal. capacity. [3] Also available with 21-in. streamlines or 22x10-4 wheels with Hyd. brakes

Fleetwings F-501



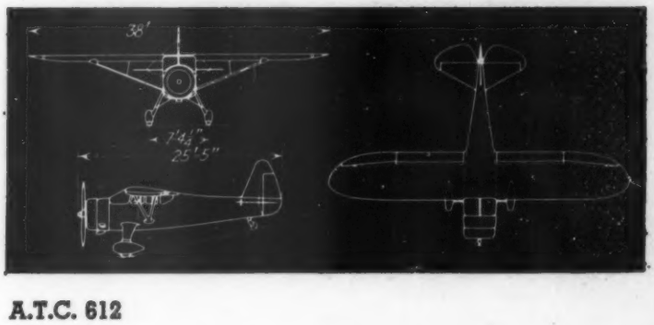
A.T.C. 680

Gwinn Aircar Model One

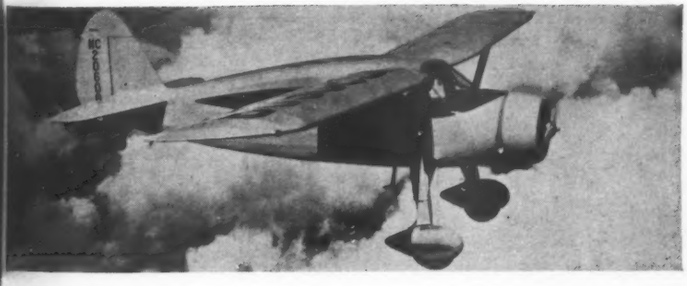


A.T.C. 682

Howard DGA



A.T.C. 612



No A.T.C

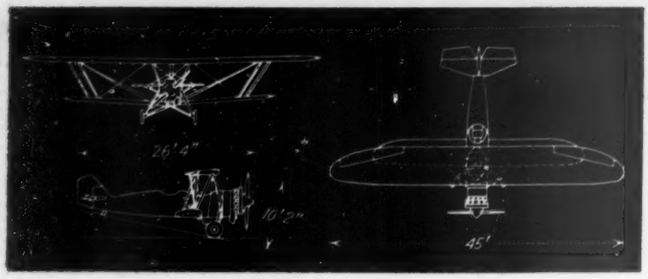
Fairchild F-24

Bellanca Model 14-9, 14-7

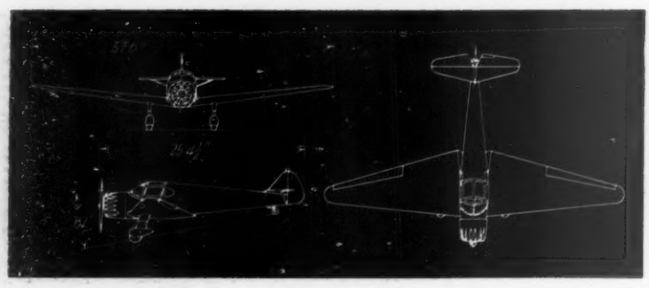
No A.T.C

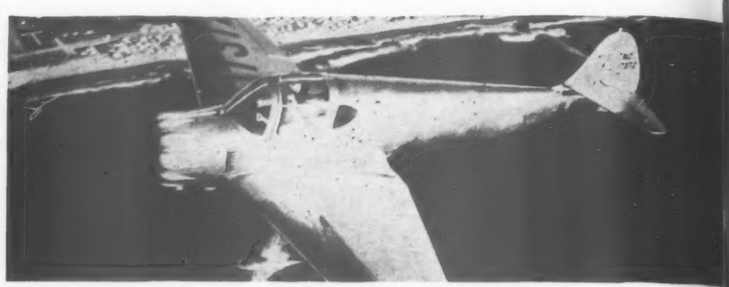
Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabiliser	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
14.2	10.0	2,515	4,200	32′	26′10″	8′	296.4	23.75	6.56	8.7	24.5	16.6	Sp,Sol	Sp	Fab	Re	86	Go 750x10	Hyd	Sp,Ol	RW	ST,Wl,Fab
14.2	10.5	2,515	4,200	32′	26′10″	8′	296.4	23.75	6.56	8.7	24.5	16.6	Sp,Sol	Sp	Fab	Re	86	Go 750x10	Hyd	Sp,Ol	RW	ST,Wl,Fab
11.3	11.7	2,080	3,350	32′	25′11″	8′	296.4	23.75	5.54	8.7	23.7	15.1	Sp,Sol	Sp	Fab	Re	86	Go 750x10	Hyd	Sp,Ol	RW	ST,Wl,Fab
11.9	10.7	2,155	3,550	32′	25′11½″	8′	296.4	23.75	5.54	8.7	23.7	15.1	Sp,Sol	Sp	Fab	Re	86	Go 750x10	Hyd	Sp,Ol	RW	ST,Wl,Fab
11.25	*18.3*	*943*	*1,650*	*34′2″*	*21′3″*	*6′3″*	*140.0*	*14.0*	*6.5*	*5.8*	*16.07*	*9.36*	*Spr,Ro*	*Sp*	*Fab*	*Re*	*8′9″*	*SmiBal8:00x4*	*Go,Hyd*	*Re,Oleo*	*Wh*	*ST,Fab*
11.25	*23.5*	*912*	*1,650*	*34′2″*	*21′3″*	*6′3″*	*140.0*	*14.0*	*6.5*	*5.8*	*16.07*	*9.36*	*Spr,Ro*	*Sp*	*Fab*	*Fz*	*8′9″*	*SmiBal8:00x4*	*No Brake*	*Fz,Oleo*	*Sk*	*ST,Tab*
13.0	16.2	1,380	2,350	34′2″	24′8″	7′0″	181	12.35	7.1	6.11	17.3	13.0	Lmd,Sp	Sp	Fab,D	Fx	87	6.50x10 [5]	Go,Hyd	Ol Cessna	Wh	ST,Wl,Fab
16.1	12.5	2,512	4,000	39′6″	30′5″	8′	248.0	20.8	7.6	11.4	19.37	20.13	Sp,Box	Sp	Fab	Re	111	Ha 8.50x10	Hy Gr	Ol	Wh	ST,Wl,Fab
13.1	*17.6*	*1,419*	*2,550*	*36′4″*	*23′9″*	*7′4″*	*193.3*	*21.0*	*6.1*	*10.1*	*21.9*	*13.5*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*111*	*Ha 7.50–10*	*Hy, Pal*	*Ol*	*Wh*	*ST,Ws,Fab*
13.1	*17.6*	*1,485*	*2,550*	*36′4″*	*23′9″*	*7′4″*	*193.3*	*21.0*	*6.1*	*10.1*	*21.9*	*13.5*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*111*	*Ha 7.50–10*	*Hy, Pal*	*Ol*	*Wh*	*ST,Wl,Fab*
13.1	*17.0*	*1,502*	*2,550*	*36′4″*	*24′10″*	*7′4″*	*193.3*	*21.0*	*6.1*	*10.1*	*21.9*	*13.5*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*111*	*Ha 7.50–10*	*Hy, Pal*	*Ol*	*Wh*	*ST,Wl,Fab*
13.1	*17.0*	*1,568*	*2,550*	*36′4″*	*24′10″*	*7′4″*	*193.3*	*21.0*	*6.1*	*10.1*	*21.9*	*13.5*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*111*	*Ha 7.50–10*	*Hy, Pal*	*Ol*	*Wh*	*ST,Wl,Fab*
14.7	*12.1*	*2,320*	*3,450*	*40′6″*	*32′0″*	*12′6″*	*235.0*	*23.3*	*18.9*	*12.5*	*8.7*	*15.1*	*SS,Wl*	*SSWl*	*Fab*	*Re*	*93½*	*7½x10*	*Gr Pal*	*Bz*	*Wh*	*SS,Wl*
15.96	12.5	2,453.7	3,750	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16.	12.67	2,509.7	3,800	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10.0	18.9	1,090	1,700	24′	16′3″	6′10″	169.4	17.4	.....	None	12.84	9.3	Sol,Sp	S,D	Fab	Ty	70	Shn,Lp6.00x6	ShinnMech	OSpr	None	D,Mo
10.0	*13.1*	*1,090*	*1,700*	*24′*	*16′3″*	*6′10″*	*169.4*	*17.4*	.....	*None*	*12.84*	*9.3*	*Sol,Sp*	*S,D*	*Fab*	*Ty*	*70*	*Shn,Lp6.00x6*	*ShinnMech*	*OSpr*	*None*	*D,Mo*
20.48	11.87	2,350	3,800	38′	25′8″	8′5″	185.5	18.54	9.81	9.62	20.44	19.4	Sol,Sp	Sp	Ply	Fx	90	Gr 7.50x10	Gr Hyd	Ol,Hwd	Wh	ST,Wl,D,Fab
22.15	*9.11*	*2,500*	*4,100*	*38′*	*25′5″*	*8′5″*	*185.5*	*18.54*	*9.81*	*9.62*	*20.44*	*19.4*	*Sol,Sp*	*Sp*	*Ply*	*Fz*	*90*	*Gr 8.50x10*	*Gr Hyd*	*Ol,Hwd*	*Wh*	*ST,Wl,D,Fab*
18.1	*12.6*	*2,300*	*3,800*	*38′*	*25′6″*	*8′5″*	*210.0*	*18.54*	*9.81*	*9.62*	*20.44*	*19.4*	*Sol,Sp*	*Sp*	*Ply*	*Fz*	*90*	*Gr 7.50x10*	*Gr Hyd*	*Ol,Hwd*	*Wh*	*ST,Wl,D,Fab*

With 2 position propeller. [5] 5. Minimum speed, power on, level flight. Restricted control, stall not possible. Key:— See page 41. [9] Rm Ri

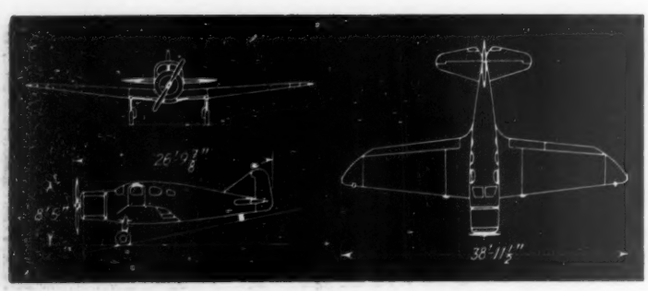


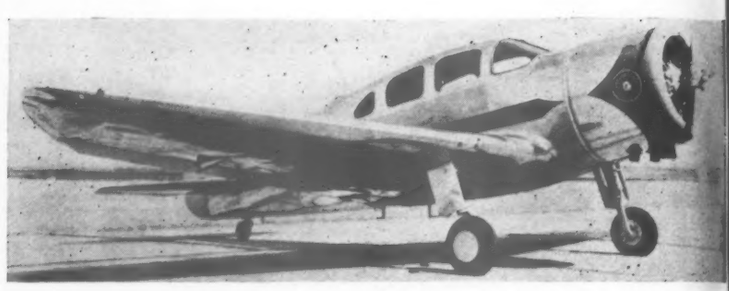
A.T.C. 108 **Jones New Standard D-25**



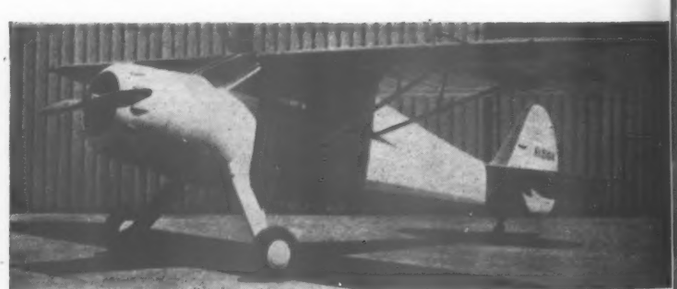


A.T.C. 658 **Ryan SC-W145**





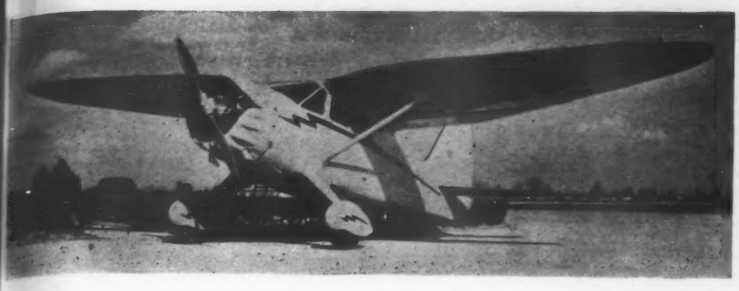
A.T.C. 628 **Spartan Executive 7W**



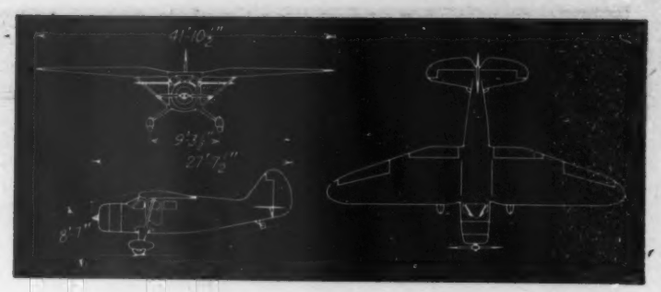
No A.T.C. **Twin Monocoach-H** **Ong M-32W** **No A.T.C.**

3 to 5 Seats	General					Power Plant							Performance							
	Designation or Model No.	A.T.C.	Price	Type	Seats	Engine	Total h.p.	Altitude	Fuel cap. (gal.)	Normal range (mi.)	Fuel con. cruising speed (gal. per hr.)	Propeller diam. — (in.)	High speed (m.p.h.)	Altitude	Cruising (m.p.h.)	Altitude	Stalling (m.p.h.)	Climb S. L. (ft. per m.)	Serv. ceiling (ft.)
Jones Aircraft Corp.	New Standard D-25	108	.....	OLB	5	Wr	220	S.L.	62	450	12.0	108	125	S.L.	95	S.L.	40	800	18,000
Monocoupe Corp.	*Twin Monocoach-H*	.....	.....	*CML*	4–5	*2Lam*	*180*	*S.L.*	*70*	*862*	*10.0*	*78*	*150*	*S.L.*	*135*	*8,600*	*48*	*560*	*18,000*
Ong Aircraft Corp.	*M-32W*	.....	*6,485*	*CML*	4	*War*	*145*	*S.L.*	*40*	*580*	*9.5*	*90*	*156*	*S.L.*	*135*	*S.L.*	*50*	*900*	*17,000*
Ong Aircraft Corp.	*M-32*	.....	.....	*CML*	4	*Men*	*150*	*3,000*	*40*	*572*	*10.0*	*84*	*163*	*3,000*	*139*	*3,000*	*50*	*1,000*	*19,000*
Ryan Aeronautical Co.	SC-W145	658	.....	CML	3	War	145	S.L.	37	525	9.5	82	150	S.L.	135	8,500	45	900	17,200
Spartan Aircraft Co., Inc.	Executive 7-W	628	.....	CML	5	Pwj	450	S.L.	112	900	24.0	102	.....	.....	205	9,600	57	1,530	22,000
Stinson Aircraft Div.	SR-10B	*678	.....	CML	4–5	Ly,Rm,Ri	245	S.L.	76	680	17.0	102	.....	.....	152	4,000	57.5	870	12,700
Stinson Aircraft Div.	SR-10C	678	.....	CML	4–5	Ly,Rm,Ri	260	S.L.	76	680	17.2	102	.....	.....	154.5	4,000	57.5	920	13,500
Stinson Aircraft Div.	SR-10DD	679	.....	CML	4–5	WrWw, [9]	300	S.L.	100	825	19.5	102	.....	.....	161	5,500	59.5	995	15,000
Stinson Aircraft Div.	SR-10ED	679	.....	CML	4–5	WrWw, [9]	350	S.L.	100	835	19.5	102	.....	.....	163	6,300	59.5	1,160	17,500
Stinson Aircraft Div.	SR-10FD	685	.....	CML	4–5	Pwj, SB	450	S.L.	100	680	26.0	102	.....	.....	177.5	9,600	63	1,330	21,000
Stinson Aircraft Div.	SR-10FD	685	.....	CML	4–5	Pwj, TB	440	S.L.	100	660	26.0	102	.....	.....	172	7,000	63	1,300	20,500
Stinson Aircraft Div.	SR-10G	678	.....	CML	4–5	Ly,Rm,Ri	290	S.L.	76	655	18.3	102	.....	.....	158	4,300	57.5	1,030	15,000
Stinson Aircraft Div.	*SR-10H*	.....	.....	*CML*	4–5	*Ly,Rm,Ri,*	*280*	*S.L.*	*76*	*675*	*17.5*	*102*	.....	.....	*155.5*	*4,000*	*57.5*	*995*	*14,500*
Stinson Aircraft Div.	*SR-10J*	.....	.....	*CML*	4–5	*Ly,Rm,Ri*	*300*	*S.L.*	*76*	*650*	*18.7*	*102*	.....	.....	*159.5*	*4,500*	*57.5*	*1,065*	*15,500*
Waco Aircraft Co.	ZVN	677	10,695	CBL	4	Ja, Ri	285	S.L.	95	[8] 698	17	.....	156	S.L.	147	6–9,000	56	775	13,000
Waco Aircraft Co.	AVN	677	11,375	CBL	4	Ja, Ri	300	3,700	95	[8] 625	19.5	.....	161	S.L.	151	6–9,000	56	900	14,200
Waco Aircraft Co.	ZGC	*664	9,895	CBL	5	Ja, Ri	285	S.L.	95	[8] 736	17	.....	164	S.L.	155	6–9,000	55	775	14,000
Waco Aircraft Co.	AGC	*664	10,495	CBL	5	Ja, Ri	300	3,700	95	[8] 687	19.5	.....	171	S.L.	161	6–9,000	55	900	15,500
Waco Aircraft Co.	EGC	*665	12,860	CBL	5	Wr, Ri	320	S.L.	95	[8] 714	18	.....	171	S.L.	159	6–9,000	55	1,000	15,500
Waco Aircraft Co.	*ZKS*	*	.....	*CBL*	5	*Ja, Ri*	*285*	*S.L.*	*70*	*[8] 504*	*17*	.....	*152*	*S.L.*	*144*	*6–9,000*	*52*	*850*	*14,000*
Waco Aircraft Co.	*VKS*	*	.....	*CBL*	5	*Con, Ri*	*240*	*S.L.*	*70*	*[8] 489*	*16.2*	.....	*145*	*S.L.*	*136*	*6–9,000*	*52*	*800*	*13,000*
Waco Aircraft Co.	*VKS Fuel Inj.*	*	.....	*CBL*	5	*Con, Ri*	*250*	*S.L.*	*70*	*[8] 492*	*16.5*	.....	*145*	*S.L.*	*136*	*6–9,000*	*52*	*800*	*13,000*

[1] Take-off h.p. [2] Based on max. continuous h.p. [3] All range figures with 15% reserve fuel. [4] 7.50x10 front [9] RmRi. Key:—See page 41.

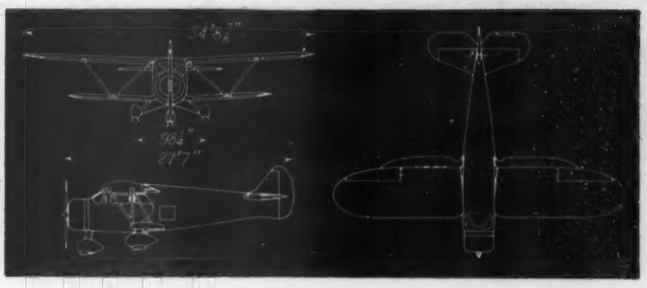


Stinson SR-10



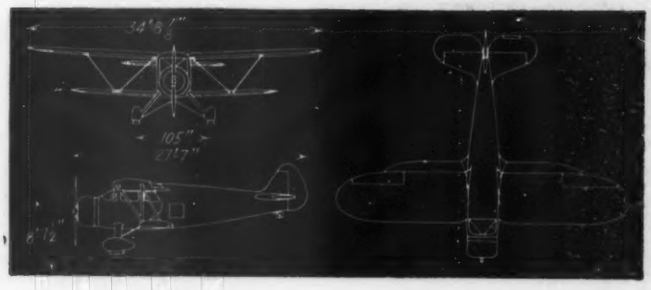
A.T.C. 678, 679, 685

Waco N



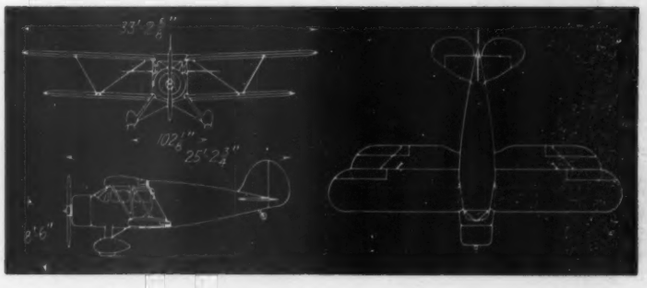
A.T.C. 677

Waco C



A.T.C. 664, 665

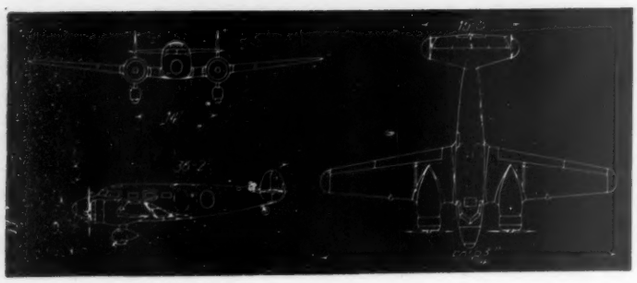
Waco S



No A.T.C.

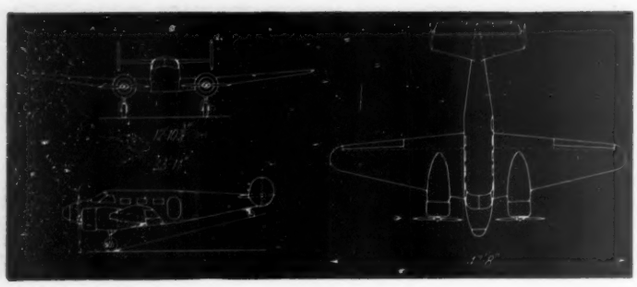
Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear							Fuselage or Hull
Wing load. (lb., sq. ft.)	Power load. (lb., h.p.)	W. empty	Gross W. (lb.)	Span	Length overall	Height overall	Wing (incl. ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landg. gear shock unit (type, make)	Tail unit		
10.0	15.4	2,010	3,400	45'	26½"	10'5"	350	26	3.5	10.7	19.5	17.1	Sp	Sp	Fab	Fx	96	Wire 32x6	Yes	Ol	Wh		D,Rv,Fab
13.9	17.9	1,882	3,220	36'	24'6"	7'10"	231.0	18.5	11.68	8.37	28.32	14.76	Sp,Box	W	Fab	Re	120	Go 7.50x10	Go,Hyd	Ol	Wh		ST,Wl,Fab
13.9	15.9	1,375	2,300	33'6"	26'1"	7'5"	166.0	17.5	8.7	8.3	16.1	11.6	Sol,Sp	Sp	Fab	Fx	109	6.50x10	Det-Mich	Air-l	Wh		ST,Wl,Fab
13.9	15.3	1,300	2,300	33'6"	26'11"	7'5"	166.0	17.5	8.7	8.3	16.1	11.6	Sol,Sp	Sp	Fab	Fx	109	6.50x10	Det-Mich	Air-l	Wh		ST,Wl,Fab
10.7	14.8	1,345	2,150	37'6"	25'4½"	6'10"	202.0	16.2	5.1	6.6	14.3	11.3	SMe	D	AD,Fab	Fx	96¾	Go 18x8-3	Go,Mech	Ol	Wh		D,Mo
17.5	9.8	2,992	4,400	39'	26'10"	8'	250.8	23.2	9.7	10.0	21.8	16.8	ST,Wl	Me	AD	Re	124	Go 7.50-10	Go,Hyd	Aer	Wh		ST,Wl,AD
15.0	17.2	2,530	3,875	41'10½"	27'7½"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
15.0	15.8	2,530	3,875	41'10½"	27'7½"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
16.0	14.6	2,725	4,150	41'10½"	27'9"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
16.0	13.0	2,725	4,150	41'10½"	27'9"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
18.0	11.6	3,045	4,650	41'10½"	27'10¾"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
18.0	11.1	3,045	4,650	41'10½"	27'10¾"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
15.0	14.1	2,540	3,875	41'10½"	27'7½"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
15.0	14.6	2,540	3,875	41'10½"	27'7½"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
15.0	13.6	2,540	3,875	41'10½"	27'7½"	8'7"	258.5	22.02	12.0	15.16	24.12	20.7	STWlTrs	RvD	Fab	Fx	111½	Ha 7.50x10	GrPalHyd	Spr,Ol	Wh		ST,Wl,Fab
14.84	12.81	2,473	3,650	34'9"	27'7"	8'6"	246	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	99	8.50x10 *	Gd GrHyd	Waco,Ol	None		.....
15.45	12.67	2,508	3,800	34'9"	27'7"	8'6"	246	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	99	8.50x10 *	Gd GrHyd	Waco,Ol	None		.....
15.45	13.33	2,328	3,800	34'9"	27'7"	8'7½"	246	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	108	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....
15.45	12.67	2,363	3,800	34'9"	27'7"	8'7½"	246	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	108	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....
15.45	11.88	2,432	3,800	34'9"	27'4"	8'7½"	246	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	108	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....
13.32	11.40	2,020	3,250	33'3"	25'4"	8'4"	244	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	102	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....
13.32	13.54	2,010	3,250	38'3"	25'4"	8'4"	244	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	102	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....
13.32	12.80	2,010	3,250	33'3"	25'4"	8'4"	244	.....	.....	.....	.....	.....	Sp	Sp	Fab	....	102	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....

AIRPLANES of 6 or more SEATS

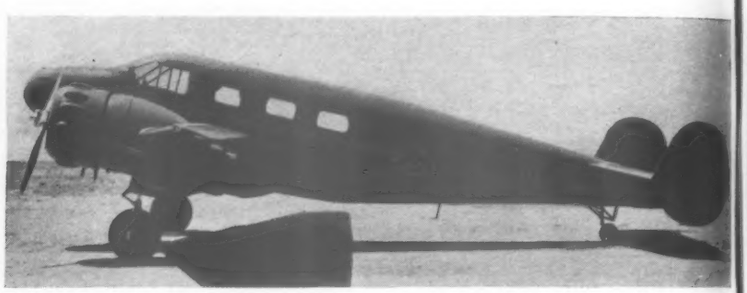


ATC 662

Barkley Grow T8P-1



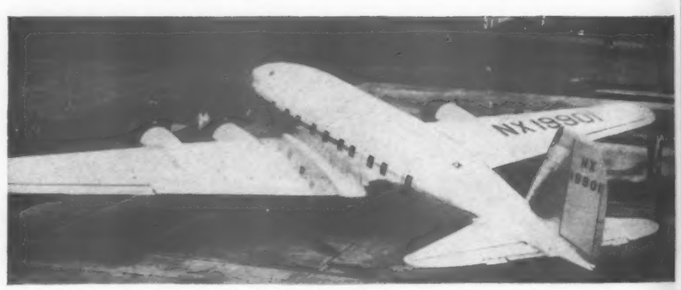
ATC 684



Beech 18-D

No ATC

Boeing 316



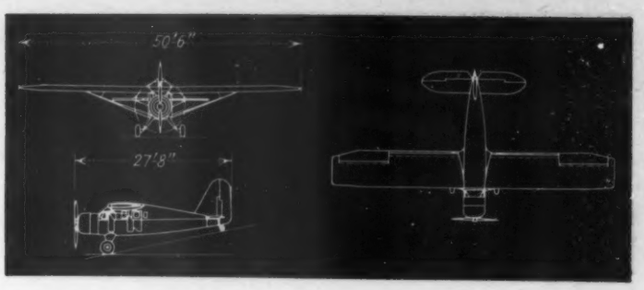
Boeing 307

No ATC

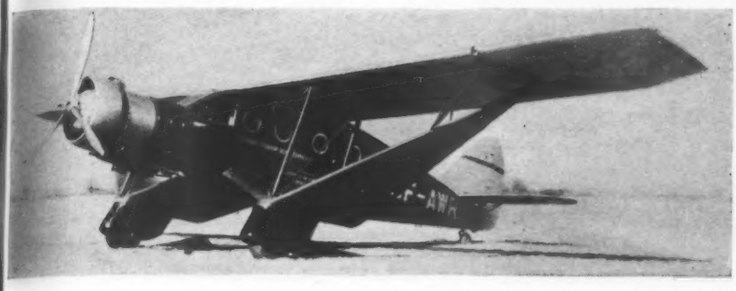
6 or more Seats	General					Power Plant						Performance						
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
Air Transport Mfg. Co., Ltd.	T-6	223	.....	CML	6	3-K	300	S.L.	85	450	18.0	78	140	1,000	125	1,000	47	1,100	18,000
Air Transport Mfg. Co., Ltd.	*B-6*[2]	.....	.....	*CML*	6	*2WrWs*	*500*	*S.L.*	*100*	*500*	*30.0*	*90*	*190*	*1,000*	*180*	*1,000*	*52*	*1,230*	*21,000*
Air Transport Mfg. Co., Ltd.	*B-8*	.....	.....	*CML*	8	*2WrWs*	*640*	*S.L.*	*140*	*720*	*35.0*	*100*	*195*	*S.L.*	*180*	*S.L.*	*55*	*1,400*	*22,000*
Barkley-Grow Aircraft Corp.	T8P-1[1]	662	.....	.....	...	2Pwj	400	5,000	210	685	42.0	102	224	8,000	216	S.L.	62	1,710	26,000
Beech Aircraft Corp.	18-D	*684	.....	CML	8–9	2JaRm,Ri	660	3,700	160	850	35.0	99	206	S.L.	195	9,750	55	1,425	22,000
Beech Aircraft Corp.	*18-S*	.....	.....	*CML*	*6–8*	*2 Pwj*[3]	*900*	*S.L.*	*210*	*1,000*	*46.0*	*99*	*240*	*S.L.*	*225*	*11,000*	*55*	*2,800*	*29,500*
Beech Aircraft Corp.	18-A	*630	.....	CML	8–9	2WrWw,[3]	640	S.L.	160	850	35.0	99	206	S.L.	196	9,750	55	1,500	24,000
Bellanca	Aircruiser Cargo	*563	.....	CQL	15	WrCy	715	3,900	300	610	42.0	150	165	7,000	155	12,000	64	700	16,000
Bellanca	Sr. Pacemaker	*578	.....	CML	6	WrWh	420	S.L.	200	860	25.2	108	160	S.L.	145	S.L.	64	700	12,000
Bellanca	Sr. Skyrocket	*565	.....	CML	6	Pww	550	5,000	200	600	36.3	108	190	5,000	180	12,000	64	1,240	25,000
Boeing Aircraft Company	*307*	.....	.....	*CML*	*37*	*4WrCy,*[3]	*4,400*	*S.L.*	*1,275*	*1,610*	*158*	*138*	*241*	*6,000*	*215*	*10,000*	*70*	*1,250*	*23,300*
Boeing Aircraft Company	*314*	.....	.....	*CMF*	*82*	*4WrCyy,*[3]	*6,000*	*S.L.*	*4,200*	*4,000*	.....	*168*	.....	.....	*173*	*10,000*	*70*	*650*	*14,000*
Burnelli Aircraft, Ltd.	*UB-14*	.....	.....	*CML*	*14*	*2Pwh*	*1,500*	*7,000*	*300*	*600*	*108.0*	.....	*225*	*6,000*	*185*	*6,000*	*63*	*1,250*	*22,000*
Douglas Aircraft Co., Inc.	DC-2	[5] 540	.....	CML	14	*4*	1,420	7,000	510	1,225	80.0	132	210	8,100	196	12,500	60	1,090	23,200
Douglas Aircraft Co., Inc.	*DC-4*	.....	.....	*CML*	*[6]47*	*4Pw*	*5,600*	.....	*2,050*	.....	.....	.....	*240*	*7,000*	*200*	*10,000*	*69*	*1,175*	*22,900*
Douglas Aircraft Co., Inc.	DST	607	.....	CML	14	2WrCy[3,9]	2,200	7,000	822	1,545	100.0	138	216	7,000	188	10,000	64	890	21,800

[1] Available with Federal skis. Will be available in spring with both Pratt & Whitney and Wright engines. [2] With all equipment for airline operation. [3] Also 2-495. [4] Available with

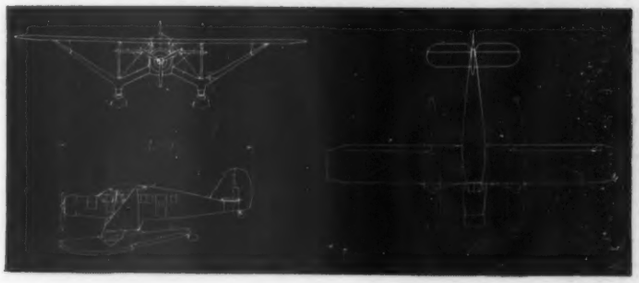
Bellanca Skyrocket, Pacemaker



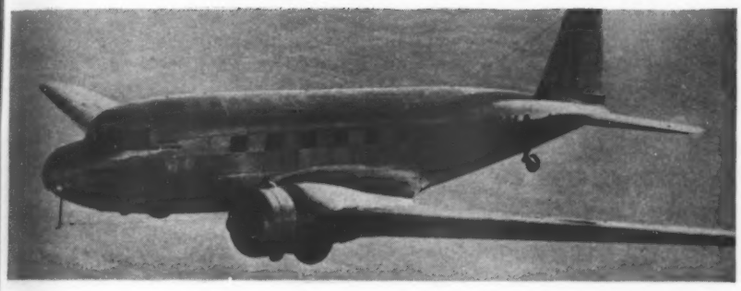
A.T.C. 578, 565



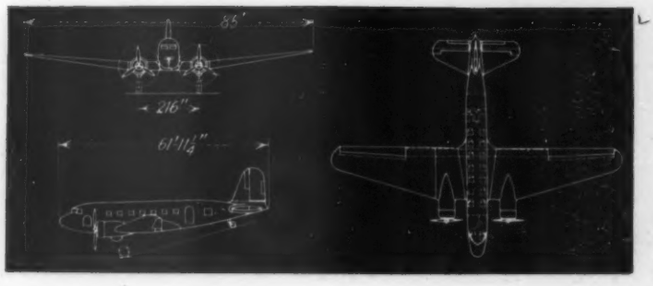
Bellanca Aircruiser Cargo



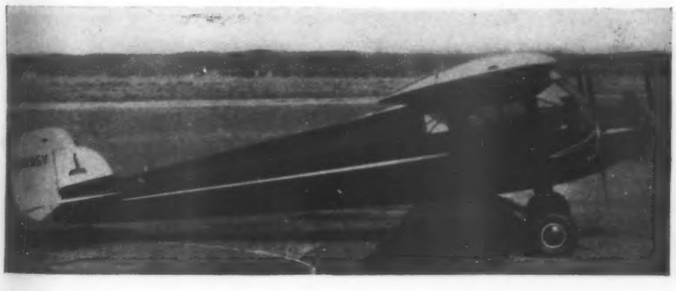
A.T.C. 563



Douglas DC-2



A.T.C. 540



A.T.C. 223

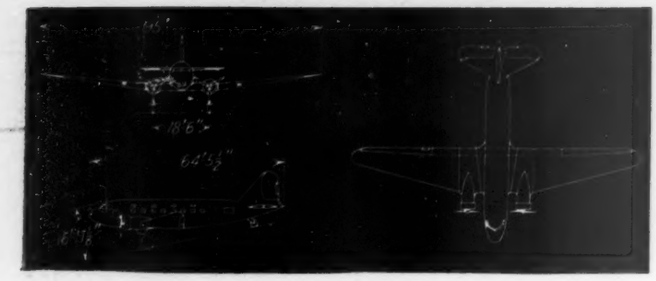
Air Transport T-6

Douglas DC-4

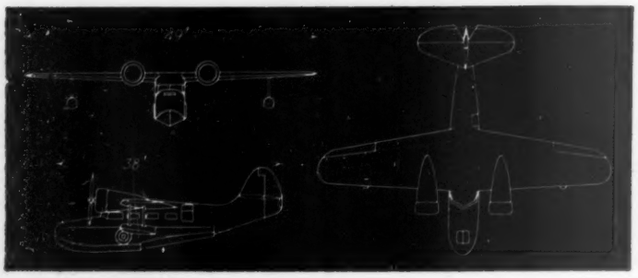
No A.T.C.

Weights				Dimensions			Area (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull†
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
14.3	15.00	2,752	4,500	48'10"	33'6"	9'6"	315.0	32.0	5.50	12.0	29.0	19.0	Sp,Box	W	Fab	Fx	165½	Aut9 .50x12	Aut	Ol	Wh	ST,Wl,Fab
14.6	*11.00*	*3,102*	*5,500*	*48'10"*	*33"*	*10'*	*377.0*	*32.0*	*6.84*	*13.77*	*27.08*	*21.27*	*Sp,Boz*	*W*	*Fab*	*Fz*	*136*	*Aut9 .50x12*	*Aut*	*Ol*	*Wh*	*ST,Wl,Fab*
18.05	*16.16*	*3,730*	*6,500*	*50'*	*35'4"*	*10'4"*	*360.0*	*30.5*	*10.9*	*13.4*	*35.7*	*22.6*	*Ro,Sp*	*W*	*Fab*	*Fz*	*146*	*Aut27"*	*AutHyd*	*Ol*	*Wh*	*ST,Wl,Fab*
23.3	10.3	5,448	8,250	50'8¾"	36'2"	9'7½"	354.0	20.5	14.7	18.9	39.4	28.2	D	None	D	Fx	168	Go30x13-6	GoHyd	Aer	Wh	D,Rv,Mo
20.7	10.9	4,350	7,200	47'8"	31'11"	9'5"	347.0	23.9	14.3	14.0	39.3	27.5	ST,WL	D	D	Re	154¾	Go29x13.5	Hyd	Air-Oil	RW	D
20.7	*8.0*	*4,720*	*7,200*	*47'8"*	*31'11"*	*9'5"*	*347.0*	*23.9*	*14.3*	*14.0*	*39.3*	*27.5*	*ST,WL*	*D*	*D*	*Re*	*154¾*	*Go29x13.5*	*Hyd*	*Air-Oil*	*RW*	*D*
20.7	11.2	4,410	7,200	47'8"	31'11"	9'5"	347.0	23.9	14.3	14.0	39.3	27.5	ST,WL	D	D	Re	154¾	Go29x13.5	Hyd	Air-Oil	RW	D
17.20	15.90	6,115	11,400	65'	42'9"	11'6½"	664.0	46.0	21.0	21.0	60.0	30.0	Ro,Sp	S	Fab	Fx	216	GoAW36x16	Go	Ol	Wh	ST,Wl,Fab
15.50	13.30	3,250	5,600	50'6"	27'11"	8'6"	359.0	40.0	16.0	12.0	39.0	23.40	Ro,Sp	S, Ply	Fab	Fx	96⅝	GenSi31"	Bx	Ol	Wh	ST,Wl,Fab
15.50	10.20	3,440	5,600	50'6"	27'11"	8'6"	359.0	40.0	16.0	12.0	39.0	23.40	Ro,Sp	S, Ply	Fab	Fx	96⅝	GenSi31"	Bx	Ol	Wh	ST,Wl,Fab
.....	*10*	*[2]28,000*	*45,000*	*107'3"*	*74'4"*	*17'3"*	.....	.....	.....	.....	.....	.....	*D*	*D*	*AD*	*Re*	*315*	*GrHa19z23*	*GrDscHyd*	*Ol, Pn*	*RW*	*D,RvAD*
.....	*13.75*	*[2]48,865*	*82,500*	*152'*	*106'*	*27 7"*	.....	.....	.....	.....	.....	.....	*D,S*	*D*	*AD,Fab*	.....	.....	.....	.....	.....	.....	*D,Rv,AD*
20.4	*9.65*	*8,000*	*14,000*	*71'*	*44'*	*10'*	*686.0*	*55.0*	*26.0*	*44.0*	*62.0*	*47.5*	*Rs,D*	*D*	*D*	*Re*	*126*	*Aut*	*Aut*	*Aer,Ol*	*Wh*	*D,Ru,D*
19.40	12.80	12,000	18,560	85'	62'	21'1"	939.0	87.0	23.0	43.0	42.0	58.6	*Rs,AD*	*AD*	*AD*	*Re*	*216*	*Bz42z15.00*	*Bz*	*Bz*	*Wh*	*D,Rs,AD*
30.15	*[7]11.61*	*[8]43,750*	*65,000*	*138'3"*	*97'7"*	*24'6½"*	*2,156*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24.3	10.9	16,300	24,000	95'	64'5½"	16'11½"	987.0	102.8	37.9	46.7	94.5	83.4	Rv,AD	AD	AD	Re	.....	Bx45x17.00-16	Psl	Bx	Wh	D,Rv,AD

Cyclones or Hornets. [5] Available also with Twin Wasps. [6] Day plane. Sleeper 37. [7] Takeoff. [8] Day plane. Sleeper — 45,000. [9] Rm, Ri. Key — See page 41.



A.T.C. 618 **Douglas DC-3**



A.T.C. 654 **Grumman G-21A**

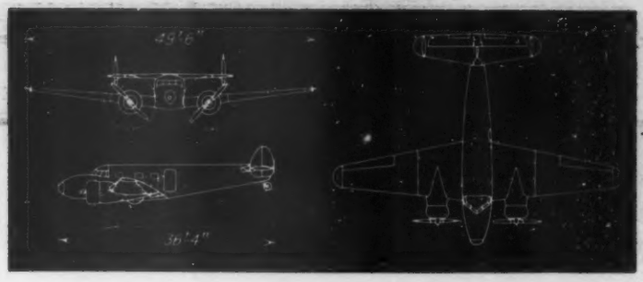
A.T.C. 551, 584, 590 **Lockheed Electra**

No A.T.C. **Martin 156**

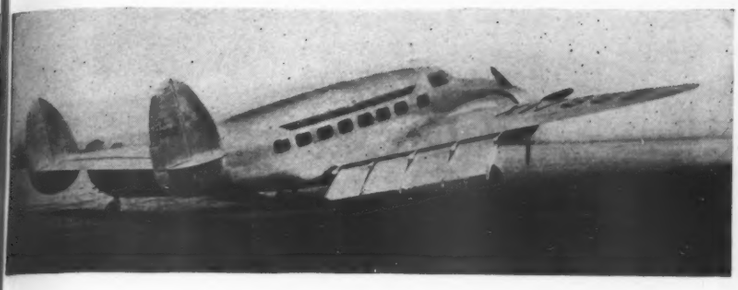
Curtiss-Wright 20 No A.T.C.

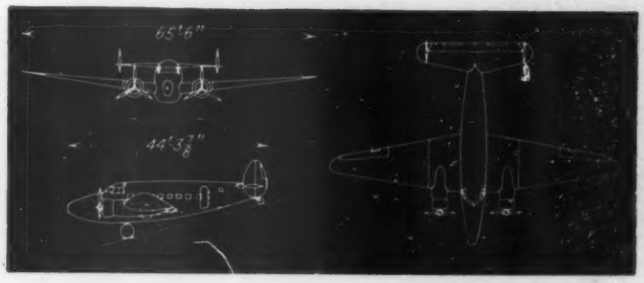
6 Seats and over	General					Power Plant						Performance						
	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
St. Louis Airp. Div., Curtiss Wright Corp.	*Transport C-W 20*			*CML*	*30*[1]	*2WrCy*[2,9]			*1,000*	*1,980*	*132*	*174*	*237*	*12,000*	*200*	*10,000*	*66*	*1,440*	*33,000*
Douglas Aircraft Co., Inc.	DC-3	618		CML	21	2WrCy[4,9]	2,200	6,800	822	1,685	93.6	138	212	6,800	190	10,000	64	850	21,500
Grumman Aire. Enz. Corp.	G-21A	654		CMA	8	2Pwj,Ri	800	5,000	220	800	51	102	201	5,000	190	9,600	62	1,300	22,000
Lockheed Aircraft Corp.	Electra 10A	551		CML	12	2Pwj,[9]	800	5,000	194	810	52.0	108	210	5,000	195	9,600	64	1,100	21,150
Lockheed Aircraft Corp.	Electra 10A-1	551		CML	12	2Pwj,[9]	800	5,000	194	800	52.0	108	205	5,000	192	9,600	65	1,000	20,200
Lockheed Aircraft Corp.	Electra 10B	584		CML	12	2WrWw,[9]	840	1,400	194	780	52.0	108	200	S.L.	186	7,500	64	1,230	18,200
Lockheed Aircraft Corp.	Electra 10E	590		CML	12	2Pww,[9]	900	10,500	250	830	71.0	108	215	10,500	205	9,600	65	1,200	25,800
Lockheed Aircraft Corp.	Model 12A-1	616		CML	8	2Pwj,[9]	800	5,000	200	780	52.0	106	226	5,000	213	9,600	65	1,700	23,350
Lockheed Aircraft Corp.	*Model 12B*			*CML*	*8*	*2WrWw,[9]*	*840*	*1,400*	*200*	*1,207*	*52.0*	*106*	*220*	*1,400*	*210*	*5,580*	*65*	*1,700*	*22,700*
Lockheed Aircraft Corp.	Model 14H	657		CML	14	2Pwh,[9]	1,600	2,500	650	1,780	84.0	126	250	5,000	227	12,000	65	1,495	24,930
Lockheed Aircraft Corp.	*Model 14WF62*			*CML*	*14*	*2WrCy,[5]*	*1,520*	*5,800*	*650*	*2,125*	*91.0*	*126*	*249*	*5,800*	*231*	*12,000*	*65*	*1,421*	*24,200*
Lockheed Aircraft Corp.	*Model 14WG3*			*CML*	*14*	*2WrCy,[9]*	*1,680*	*8,700*	*650*	*2,070*	*104.0*	*126*	*264*	*8,700*	*240*	*13,500*	*65*	*1,580*	*26,500*
Glenn L. Martin Co.	156-C	697		CMF	53	4WrCy,[9]	3,400	5,800	3,800	.....	.....	144	182	5,800	140	10,000	67	.....	.....
Glenn L. Martin Co.	*157-F*			*CMF*	*57*	*4Pwh,[9]*	*4,200*	*6,500*	*4,460*	.....	.....	.....	*203*	*6,500*	*145*	*10,000*	*71*	.....	.....
Sikorsky Aircraft	S-42-B	592		CMF	37	4Pwh,[9]	3,000	7,000	1,240	1,200	168.0	138	188	7,000	163	7,000	65	800	15,000
Sikorsky Aircraft	S-43	593		CMA	18	2Pwh,[9]	1,500	7,000	400	775	84.0	138	190	7,000	166	7,000	65	1,000	19,000
Sikorsky Aircraft	S-43-B	593		CMA	18	2Pwh,[9]	1,500	7,000	400	775	84.0	138	190	7,000	166	7,000	65	1,000	19,000

[1] Passenger seats. [2] Performance of Twin-Row Cyclone confidential. [3] Provisional gross weight. [4] Available also with Twin Wasps. [5] On beaching gear. [6] Total vertical

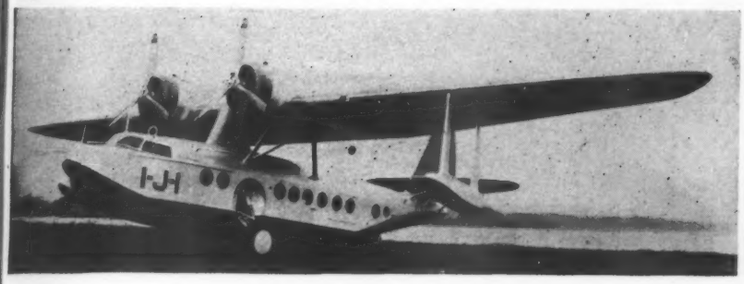


Lockheed 12 **A.T.C. 616**

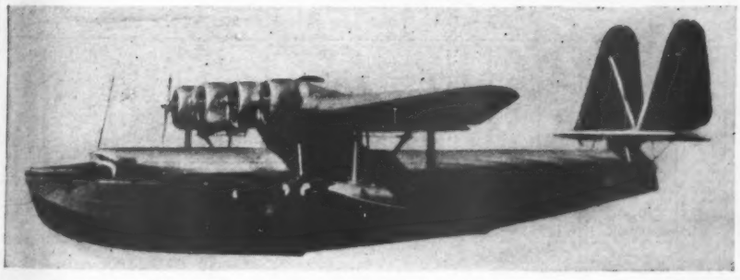




Lockheed 14 **A.T.C. 657**



Sikorsky S-43 **A.T.C. 593**



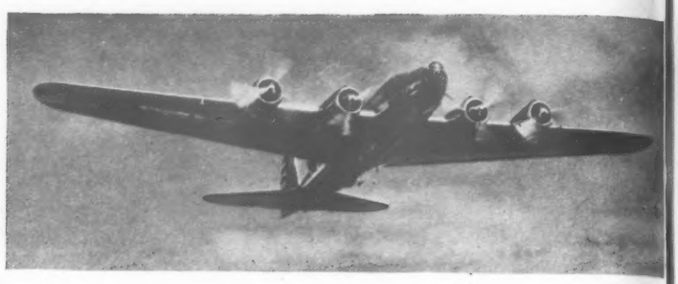
Sikorsky S-42-B **A.T.C. 592**

Weights				Dimensions			Area, (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	[2]Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
25.5	(*)	*23,500*	*36,000*	*108'*	*76'*	*19'2"*	*1,353*	*98.0*	*77.0*	*54.0*	*148.9*	*107.0*	*D*	*D Trs*	*AD*	*Re*	*311*	*19x23*	*Hyd*	*Ol, Pn*	*RW*	*D,Rs,AD*
24.3	10.9	15,300	24,000	95'	64'5½"	16'11½"	987.0	102.8	37.9	46.7	94.5	83.4	Rv,AD	AD	AD	Re	222	Bx45x16.00-16	Pal	Bx	Wh	D,Rv,AD
21.3	8.9	5,425	8,000	49'	38'4"	12'	375.0	22.5	26.7	21.0	44.8	31.2	D,Box	D	Me	Re	90⅝	Bx32x6	BxHyd	Bx,Ol	Wh	D,Mo
22.04	12.6	6,325	10,100	55'	38'7"	10'1"	458.3	29.5	17.7	19.5	69.5	35.0	AD,Rv	AD	AD	Re	.....	Go35x15-6	Go,Hyd	Aer	Wh	AD,Rv,AD
22.91	13.15	6,350	10,500	55'	38'7"	10'1"	458.3	29.5	17.7	19.5	69.5	35.0	AD,Rv	AD	AD	Re	.....	Go35x15-6	Go,Hyd	Aer	Wh	AD,Rv,AD
21.82	11.90	6,325	10,000	55'	38'9"	10'1"	458.3	29.5	17.7	19.5	69.5	35.0	AD,Rv	AD	AD	Re	.....	Go35x15-6	Go,Hyd	Aer	Wh	AD,Rv,AD
22.91	11.67	7,100	10,500	55'	38'7"	10'1"	458.3	29.5	17.7	19.5	69.5	35.0	AD,Rv	AD	AD	Re	.....	Go35x15-6	Go,Hyd	Aer	Wh	AD,Rv,AD
23.8	10.5	5,835	8,400	49'6"	36'4"	9'9"	352.0	22.1	13.6	17.3	54.4	33.8	AD,Rv	AD	AD	Re	.....	Go11.0x12	Gr,Pal	Aer	Wh	AD,Rv,AD
23.8	*10.0*	*5,885*	*8,400*	*49'6"*	*36'4"*	*9'9"*	*352.0*	*22.1*	*13.6*	*17.3*	*54.4*	*33.8*	*AD,Rs*	*AD*	*AD*	*Re*	.....	*Go11.0x12*	*Gr,Pal*	*Aer*	*Wh*	*AD,Rs,AD*
27.2	9.4	10,300	17,500	65'6"	44'¼"	11'5½"	551.0	35.05	31.52	32.59	93.58	40.39	AD,Rv	AD	AD	Re	.....	Go15.00x16	Go,Hyd	Aer	Wh	AD,Rv,AD
27.2	*9.9*	*10,300*	*17,500*	*65'6"*	*44'¼"*	*11'5½"*	*551.0*	*35.05*	*31.52*	*32.59*	*93.58*	*40.39*	*AD,Rs*	*AD*	*AD*	*Re*	.....	*Go15.00x16*	*Go,Hyd*	*Aer*	*Wh*	*AD,Rs,AD*
27.2	*8.95*	*10,600*	*17,500*	*65'6"*	*44'¼"*	*11'5½"*	*551.0*	*35.05*	*31.52*	*32.59*	*93.58*	*40.39*	*AD,Rs*	*AD*	*AD*	*Re*	.....	*Go15.00x16*	*Go,Hyd*	*Aer*	*Wh*	*AD,Rs,AD*
27.40	18.2	31,292	63,000	157'	91'10"	27'2½"[8]	2,300		[8]	[8]	[?]	[?]	D	D	D							D,Rv,D
30.40	*17.1*	*33,356*	*70,000*	*157'*	*91'10"*	*27'2½"[8]*	*2,300*	.....	[8]	[8]	[?]	[?]	*D*	*D*	*D*	.....	.....	.....	.....	.....	.....	*D,Rs,D*
31.3	14.0	24,000	42,000	118'2"	68'	21'5"	1,340	103.7	64.0	62.0	146.0	79.4	D,Trs	D	D,Fab	.....	.....	.....	.....	.....	.....	D,Rv
25.0	13.0	12,900	19,500	86'	51'2"	17'8"	780.6	53.2	35.4	30.6	86.4	41.7	D,Box	D	D,Fab	Re	134	Ha,Aut,17x45	Hyd	Ol	Wh	D,Rv
25.64	13.33	13,100	20,000	86'	52'3"	17'8"	780.6	53.2	26.8	30.74	86.4	58.47	D,Box	D	D,Fab	Re	134	Ha,Aut 17x45	Hyd	Ol	Wh	D,Rv

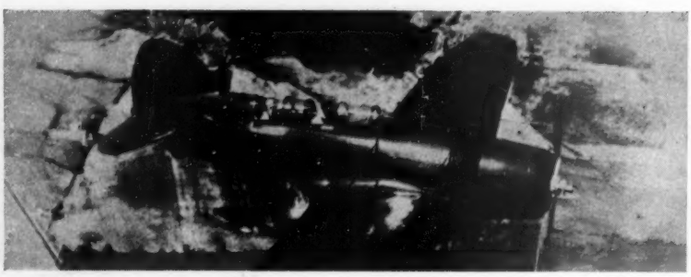
[8]Rm, 221 sq. ft. [?] Total horizontal area, 358 sq. ft. [9] Rm, R.. Key:—See page 41.

MILITARY AIRCRAFT

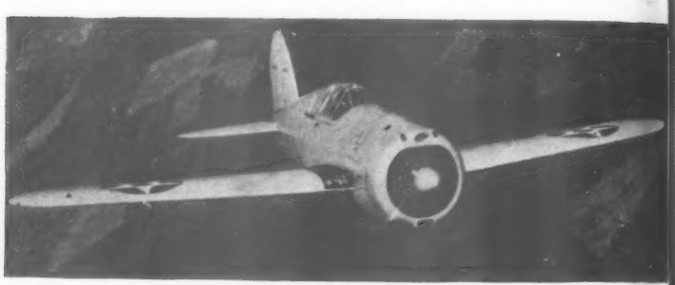
Bell Airacuda



Boeing Y299 (Army Air Corps B-17)



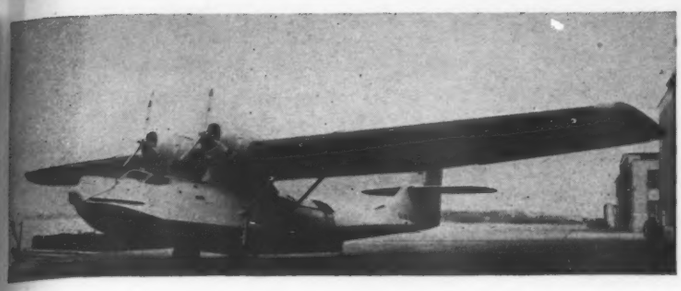
Bellanca 28



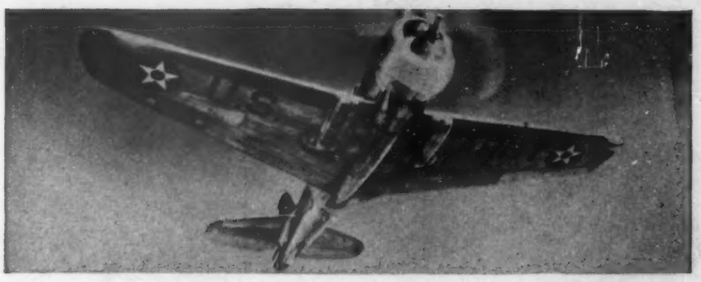
Brewster 138

Military for export	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Power Plant: Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	Performance: High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
Bell	BG-1	Mil		CBL		WrCyRi	755			860			206	11,300			71.9		24,950
										1,000			210						28,500
Bellanca Aircraft Corp.	28-90	Mil		OML	2	Pwww	950	6,500	150	800		126	280	6,500	250	6,500	68	2,800	30,000
Bellanca Aircraft Corp.	28-110	Mil		CML		Pwww	1,100						291						
Boeing Aircraft Company	299Y Flying Fortress (U.S. Army Air Corps B-17)	Mil		CML		4WrCy, Ri,Rm	4,000	S.L.	1,700	2,500		135	250	10,000	220	10,000	70	1,400	25,000
Brewster Aeronautical Corp.	138	Mil		CML		WrCy	750	15,200	136			108							
Curtiss Aero. Div. Curtiss-Wright Corp.	Shrike	Mil		CML	2	WrCyRi	775	S.L.	114	603	40.0	108	206	Crit	171	Crit	67.9	1,500	20,700
Curtiss Aero. Div. Curtiss-Wright Corp.	Hawk 75	Mil		CML	1	WrCyRi	840	S.L.	107	547	46.0	120	280	Crit	241	Crit	68	2,400	31,400
Curtiss Aero. Div. Curtiss-Wright Corp.	Hawk III	Mil		OBL	1	WrCyRi	715	S.L.	110	575	39.0	108	240	Crit		Crit	67.9	1,600	25,800
Curtiss Aero. Div. Curtiss-Wright Corp.	Hawk IV	Mil		OBL	1	WrCyRi	745	S.L.	110	577	40.0	108	248	Crit	211	Crit	69	1,640	29,700
Curtiss Aero. Div. Curtiss-Wright Corp.	Seagull	*Mil		OBL	2	PwwRi	550	S.L.	144	697	29.0	108	168	Crit	137	Crit	56	1,000	16,400
Curtiss Aero. Div. Curtiss-Wright Corp.	Helldiver-77	Mil		CBL	2	PwwjRi	850												
Curtiss Aero. Div. Curtiss-Wright Corp.	Hawk 75-A	Mil		CML	1	WrCyRi Pww	1,000	S.L.	161	677			302	Crit	260	Crit	68.1	1,100	33,100
St. Louis Airp. Div. Curtiss-Wright Corp.	19-R Trainer*	Mil		CML	2	WrWW [9]	420	1,400	70	517	24.9	99	209	2,500	191	Crit	55.4	2,800	23,000
St. Louis Airp. Div. Curtiss-Wright Corp.	19-R Military*	Mil		CML	2	WrWW [9]	420	1,400	70	482	24.9	99	209	2,500	191	Crit	55.4	2,640	22,000
St. Louis Airp. Div. Curtiss-Wright Corp.	19-R Attack	Mil		CML	2	WrWW [9]	420	1,400	70	482	24.9	99	209	2,500	191	Crit	55.4	2,640	22,000
St. Louis Airp. Div. Curtiss-Wright Corp.	21 Interceptor	Mil		CML	1	WrCy	850	6,000	96	630	46	108	287	7,500	275	17,000	68	4,800	36,000
							750	15,200					304	17,000					
St. Louis Airp. Div. Curtiss-Wright Corp.	22 Basic Combat	Mil		CML	2	WrWW	425	6,000	70	602	22	99	220	6,000	196	Crit	59.5	2,540	3,150
Douglas	B-18 Bomber	Mil		CML		2WrCy							204		180		65		24,200
Douglas (El Segundo Div.)	8-A Attack	Mil		CML	2	Pwwj	700	8,500	230	1,260	35.0	114	229	8,500	196	17,000	66	1,000	22,700
						WrCy	840	8,700	235	1,180	38.3	114	238	8,700	208	17,000	66	1,200	24,000
Grumman Airc. Eng. Corp.	G-21A	654		CMA	8	2PwjRi	800	5,000	220	800	51.0	102	201	5,000	190	9,600	62	1,300	22,000
Grumman Airc. Eng. Corp.	F3F-1 Fighter&Bomber[1]	Mil		CBL	1	Pwwj	650	7,500	110	720	33.6	102	240	7,500	215	7,500	65	2,700	29,000
Grumman Airc. Eng. Corp.	G-37 Fighter & Bomber[1]	Mil		CBL	1	WrCy	750	15,200	130	720		108	270	17,000	224	12,000	67	3,000	32,000
Grumman Airc. Eng. Corp.	F2F-1 Fighter	Mil		CBL	1	Pwwj	650	7,500	110	720	33.6	102	240	7,500	215	7,500	65.5	2,500	27,500
Grumman Airc. Eng. Corp.	FF-1 Fighter	Mil		CBL	2	WrCy	775	5,800	120	600	40.0	114	220	7,000	200	7,000	65	1,800	25,000
Grumman Airc. Eng. Corp.	JF-2 Utility			CBA	2-4	WrCy	775	5,800	150	620	37.5	108	185	7,000	155	7,000	63	1,600	22,000
Grumman Airc. Eng. Corp.	J2F-1 Utility			CBA	2-4	WrCy	775	5,800	190	780	37.5	108	180	7,000	150	7,000	64	1,500	21,000
Hall Aluminum Aircraft Corp.	PH-1 Mod-Overload	Mil		CBF	5	2WrCy	1,520	5,800	892	2,135	82.5	141	153.5	5,800	136.0	5,800	62.6	1,103	21,500
	PH-1 Mod-Normal								750	1,845			153.9		136.5		60.8	1,220	22,600
Hall Aluminum Aircraft Corp.	PH-2 Overload	CG		CBF	5	2WrCy	1,500	3,200	892	2,242	84.4	141	154.9	3,200	137.2	3,200	61.2	1,437	21,000
	PH-2 Normal								750	1,928			155.2		137.5		60.0	1,478	22,200
Lockheed Aircraft Corp.	14 Transport Bomber			CML		2WrCy [9]							260	9,300	240	13,800	65.0		27,400
Glenn L. Martin Co.	166	Mil		CML	4	2WrCy	1,800	6,000	762	2,080		137	255	Best	217	12,000	68.0	1,600	23,000
						2Pwww	2,100	6,500	762	2,000		137	268	Best			70.0	1,800	25,000
North American Aviation, Inc.	NA-25	Mil		CML	3	WrCyRi	860	10,500	150	853	41.6	132	243	10,500	217	15,000	67.0	1,800	29,700
North American Aviation, Inc.	NA-16-3	Mil		CML	2	PwwRi	550	5,000	111	900	28.8	108	210	5,000	196	12,000	67.0	1,650	24,000

[9]RiRm Key—See page 41.



Consolidated PBY



Curtiss-Wright P-36A

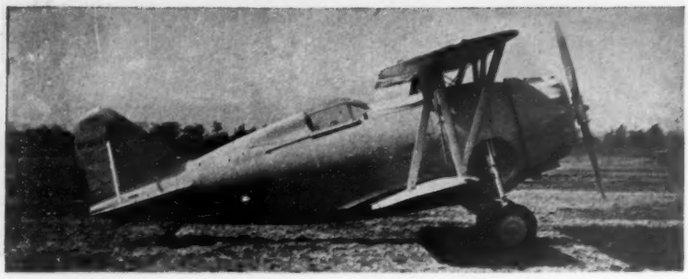
Curtiss-Wright Interceptor

Curtiss-Wright XP-40

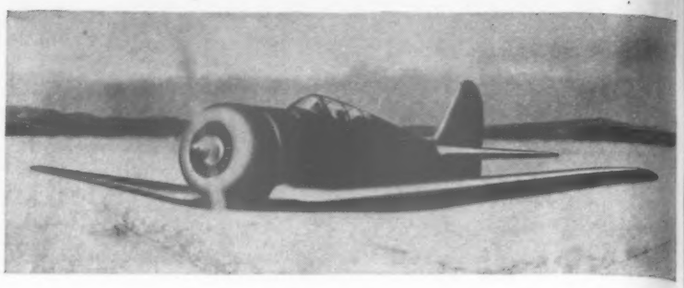
Curtiss-Wright Hawk 75

Douglas XTBD1

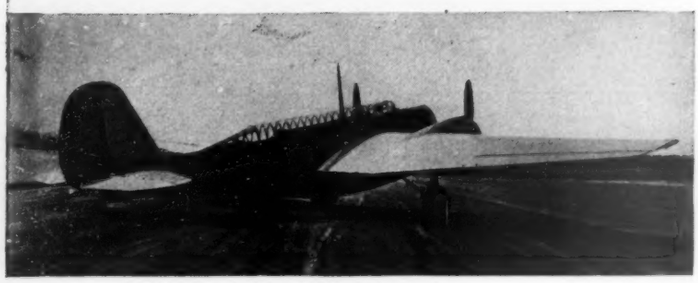
Weights				Dimensions			Area, (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
.....	.....	3,819	6,641	36′	28′9″	.....	353.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	3,779	5,619																			
.....	.....	4,450	.....	46′1¾″	26′6″	7′	279.0	.....	.....	.....	.....	.....	Lam,Sp	Ply	Fab	Re	178	Bx32x6	Bx	Ol	Wh	ST,Wl,Fab
.....	.....	4,775	8,454	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	103′9″	68′9″	15′	.....	.....	.....	.....	.....	.....	D	D	AD	Re	.....	.....	Hyd	Ol,Pn	RW	D,Rv,AD
.....	.....	.....	.....	39′	27′10″	10′11″	.....	.....	.....	.....	.....	.....	S.M.B.	Al,Tr	Al,Fab	Re	.....	27Sl	Hyd	Ol,Pn	.....	Mo
20.8	7.64	4,024	5,925	44′	31′6″	9′5″	285.0	.....	.....	.....	.....	.....	Me	Trs	Me	Fx	.....	31″	Bx	Ol	Wh	ST,Me
21.9	6.16	3,984	5,172	37′4″	28′1″	9′4″	236.0	.....	.....	.....	.....	.....	Me	Me	Me	Fx	.....	27″	Bx	Ol	Wh	Me
16.5	5.75	3,213	4,317	31′6″	23′6″	9′11″	262.0	.....	.....	.....	.....	.....	Sp,Box	Sp	Me	Re	93	32x6	Bx	Ol	Wh	ST,Me
17.35	6.17	3,404	4,598	31′6″	23′6″	10′10″	262.0	.....	.....	.....	.....	.....	Sp,Box	Sp	Me	Re	.....	32″x6	Bx	Ol	Wh	ST,Me
15.2	9.44	3,543	5,192	36′	26′6″	13′7″	342.0	.....	.....	.....	.....	.....	Me	Me	Fab	Fx	.....	8½x10″	Bx	Ol	Wh	ST,Wl,Fab
Military Confidential				32′	27′10⅜″		.....	.....	.....	.....	.....	.....	Me	Me	Me& Fab	Re	86¾	.....	Bx	Ol	Wh	AD,Me,Rv
24.1	7.59	4,483	5,692	37′4″	28′8″	9.25	236.0	.....	.....	.....	.....	.....	Me	Me	Me	Re	8.07	27″x6 ply	Bx	Ol	Wh	Me20
18.36	7.6	2,018	3,200	35′	26′4″	7′6″	174.3	11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Fx	83	7.5x10Go	GoHyd	OlSpr	Wh	D,Rv,AD
20.1	8.35	2,118	3,500	35′	26′4″	7′6″	174.3	11.9	8.06	7.36	16.98	8.58	AD	AD	AD	Fx	83	7.50x10Go	GoHyd	OlSpr	Wh	D,Rv,AD
20.1	8.35	2,118	3,500	35′	26′4″	7′6″	174.3	11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Fx	83	7.5x10Go	GoHyd	OlSpr	Wh	D,Rv,AD
24.4	5.0	3,050	4,250	35′	26′6″	9′9″	174.3	11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Re	83	7.5x10Go	GoHyd	OlPn	Wh	D,Rv,AD
20.1	8.23	2,336	3,500	35′	26′6″	9′9″	174.3	11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Re	83	7.5x10Go	GoHyd	OlPn	Wh	D,Rv,AD
.....	.....	15,175	23,200	90′	56′9″	.....	965	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
20.66	10.7	4,850	7,500	47′9″	32′1″	9′9″	363.0	27.8	9.7	17.1	35.8	28.3	AD,Mu	AD	AD	Re	132	Sl36″	Hyd	Ol,Pn	Wh	AD,Rv
20.66	8.92	4,820	7,500																			
21.3	8.9	5,425	8,000	49′	38′4″	12′	375.0	22.5	26.7	21.0	44.8	31.2	D,Box	D	Me	Re	90⅜	Bx32x6	BxHyd	Bx,Ol	Wh	D,Mo
15.8	6.3	2,870	4,100	32′	23′3″	8′9″	260.0	11.5	6.9	6.85	19.8	10.8	D	D	Fab	Re	72	Bx26x6	BxHyd	Bx	Wh	D,Mo
17.7	5.4	3,250	4,620	32′	23′	8′9″	260.0	11.5	6.9	7.8	19.8	10.8	D	D	Fab	Re	72	Bx26x6	BxHyd	Bx	Wh	D,Mo
16.5	5.8	2,625	3,780	28′6″	21′5″	8′6″	230.0	11.5	6.4	5.9	19.8	10.8	D	D	Fab	Re	72	Bx30x5	BxMech	Bx,Ol	Wh	D,Mo
15.5	6.2	3,200	4,800	34′6″	24′6″	9′5″	310.0	15.8	6.4	7.3	25.6	14.2	D	D	Fab	Re	62½	Bx32x6	BxMech	Aerol	Wh	D,Mo
14.1	7.4	4,100	5,760	39′	33′	12′8″	409.0	32.0	14.2	10.6	42.8	25.0	D	D	Fab	Re	88	Bx32x6	Bx	Aero	Wh	D,Mo
15.1	8.0	4,300	6,170	39′	34′	12′4″	409.0	32.0	14.2	10.6	32.1	24.6	D	D	Fab	Re	90	Bx30x7	BxHyd	Bx	Wh	D,Mo
14.7	11.3	9,320	17,173	72′10″	51′10″	17′6″	1170	70.6	47.3	45.0	126.7	79.8	DTrs	DTrs	Fab	.....	.....	.....	.....	.....	.....	D,Rv,D
13.9	10.7		16,250																			
14.1	11.0		16,457	72′10″	51′0″	17′11″	1170	70.6	47.3	45.0	126.7	79.8	DTrs	DTrs	Fab	.....	.....	.....	.....	.....	.....	D,Rv,D
13.3	10.4	9,275	15,545																			
.....	.....	.....	15,500	65′6″	44′3⅞″		551	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	10,900	15,600	70′6″	44′9″	11′6″	682	52.4	20.5	22.9	56.7	41.1	D	D	D	Re		45″Sl	Hyd	Ol	Wh	D,Rv,D
.....	.....	11,300	16,100	70′6″	44′9″	11′6″	682	52.4	20.5	22.9	56.7	41.1	D	D	D	Re		45″Sl	Hyd	Ol	Wh	D,Rv,D
21.88	8.86	5,897	7,595	46′3⅝″	33′2⅛″	12′5½″	348.6	32.36	11.36	22.65	35.74	29.76	D	D	AD	Re	114	33′ Diam. Smooth Cont.	Hyd	Aer	Wh	D,Mo,AD
20.25	9.43	3,852	5,190	43′	27′5¼″	8′9″	256.0	22.4	5.46	14.57	24.71	20.38	D	D	D	Re	103	27″ Diam. Smooth Cont.	Hyd	Aer	Wh	ST,Wl,Fab



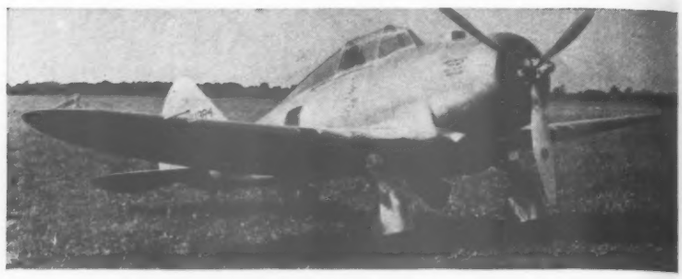
Grumman F3FI



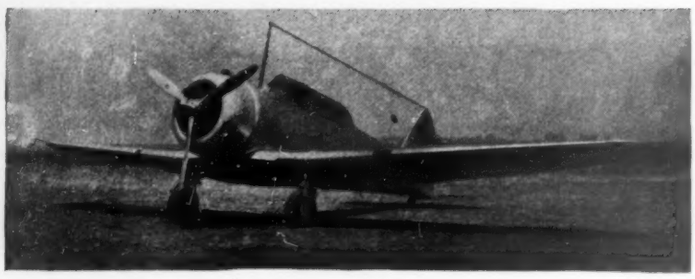
North American NA-50



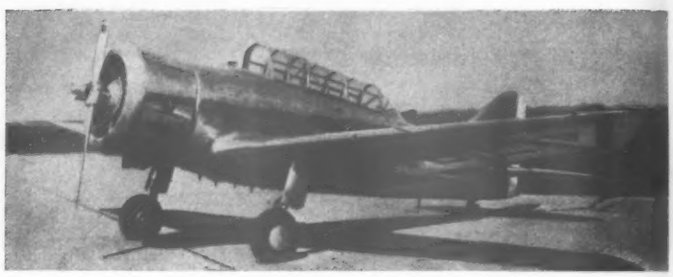
Martin 166



Seversky EP-1 Model 100



North American NA-44

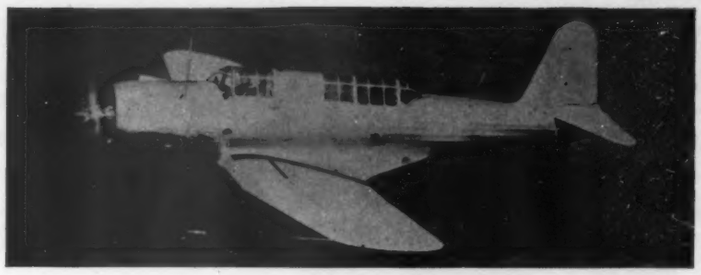


Spartan Zeus 8-W

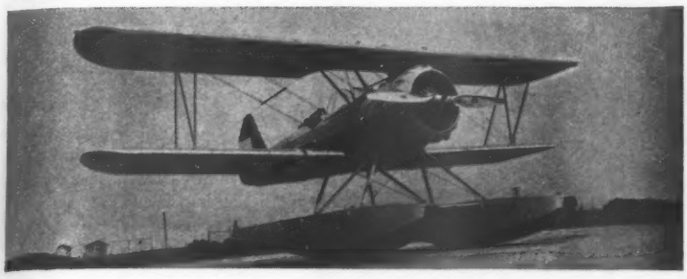
Military for export	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
						General							**Power Plant**						**Performance**
North American Aviation, Inc.	NA-44	Mil		CML	2	WrCyRi	775	5,800	170	1,300	35.5	108	249	7,500	225	15,000	70	2,120	28,100
North American Aviation, Inc.	NA-50	Mil		CML	1	WrCyRi	840	8 700	170	1,550	41.0	108	260	8,700	231	12,000	67	2,150	30,000
North American Aviation, Inc.	NA-16-1	Mil		CML	2	PwwRi	550	8,000	104	810	28.5	108	205	8,000	188	11,800	61	1,750	26,000
North American Aviation, Inc.	NA-16-2	Mil		CML	2	PwwRi	500	10,000	104	900	26.0	108	208	10,000	185	14,000	62	1,300	26,000
North American Aviation, Inc.	NA-16-5	Mil		OML	2	WrWWRi	235	S.L.	52	500	12.5	108	130	S.L.	108	S.L.	57	840	13,500
North American Aviation, Inc.	NA-16-4	Mil		CML	2	WrWWRi	420	1,400	104	920	20.3	108	174	1,400	164	8,000	57	1,400	21,000
Phillips Aviation Co.	X-PT	Mil		CML	2	Ranger	165	S.L.	38	.....	10.5	92	158	S.L.	139	5,000	46	920	17,400
Ryan Aeronautical Co.	S-T-M	Mil		OML	1–2	Men	150	3 4,000	24	330	9.8	77	160	S.L.	135	S.L.	42	1,400	21,000
								3,000	42	580									
Seversky Aircraft Corp.	2PA-A Model 230	Mil		CMA	2	WrCyRi	850	5,800	200 [3]	.....	.....	9'0"	.....	.....	.....	.....	.....	.....	.....
Seversky Aircraft Corp.	EP-1 Model 100	Mil		CML	1	PwwwRi	1,100	9,000	200 [3]	.....	.....	10'6"	.....	.....	.....	.....	.....	.....	.....
Seversky Aircraft Corp.	2PA Model 200	Mil		CML	2	PwwwRi	1,100	9,000	200 [3]	.....	.....	10'6"	.....	.....	.....	.....	.....	.....	.....
Seversky Aircraft Corp.	P-35	Mil		CML	1	PwwwRi	850	8,000	160	.....	.....	10'6"	.....	.....	.....	.....	.....	.....	.....
Spartan Aircraft Co., Inc.	Zeus 8-W	Mil		CML	2	PwwRi	550	S.L.	112	760	34.0	102	234	5,000	218	10,000	65	1,650	29,400
Spartan Aircraft Co., Inc.	Zeus 9-W	Mil		CML	2	PwjRi	450	S.L.	112	775	26.0	102	190	5,000	180	8,000	62	1,300	20,000
Stearman Aircraft Co.	73L3	*Mil		OLB	2	Ly	225	S.L.	43	340	.....	102	123	S.L.	105	S.L.	51	920	13,500
Stearman Aircraft Co.	76D1	*Mil		OLB	2	Pwj	320	S.L.	70	540	.....	105	133	S.L.	131	S.L.	57	1,000	16,700
Stearman Aircraft Co.[4]	76D1	*Mil		OLB	2	Pwj	320	S.L.	70	540	.....	105	151	S.L.	132	S.L.	56	1,060	18,400
Stearman Aircraft Co.[4]	76C3	*Mil		OLB	2	WW	420	1,400	100	550	.....	105	156	S.L.	136	S.L.	59	1,220	20,000
Stearman Aircraft Co.[4]	73L3	*Mil		OLB	2	Ly	225	S.L.	43	350	.....	105	124	S.L.	107	S.L.	52	860	12,400
Stearman Aircraft Co.	76D3	*Mil		OLB	...	PwjRi	400	5,000	100	635	.....	104	157	5,000	135	5,000	56	1,410	23,600
Stearman Aircraft Co.	S76D1	*Mil		OSB	...	Pwj	320	S.L.	70	478	.....	105	135	S.L.	118	S.L.	58	840	15,000
Chance Vought Div.— United	V-142	Mil		CBL	2	Pwwj	750	8,900	145	.....	.....	120	208	9,000	172	9,000	65	1,330	24,200
Chance Vought Div.— United	V-143	Mil		CML	1	Pwwj	750	9,000	112	951	30.3	114	300	11,000	257	18,000	65	2,800	30,600
Chance Vought Div.— United	V-156	Mil		CML	2	Pwwj	750	9,000	130	701	.....	132		Perform	ance	only on	requ	est	
Aviation Mfg. Corp.— Vultee Div.	V-12 Attack Bomber	Mil		CML	3	WrCy	900	6,500	250	1,200	.....	132	243	19,000	218	15,000	69	1,300	25,500
									494	2,070			222	19,000	190	15,000	72	865	22,000
Aviation Mfg. Corp.— Vultee Div.	V-11-GB2 Attack Bomber	Mil		CML	...	WrCy	850	5,800	250	1,240	.....	114	223	6,800	206	12,200	68	890	19,500
									494	2,420			205	6,800	189	12,000	71	690	15,600
Waco Aircraft Co.	JHD	Mil		CBL	...	WrRi	365	S.L.	.....	.....	.....	.....	170	S.L.	155	.....	.....	.....	.....
Waco Aircraft Co.	WHD	Mil		CBL	...	WrRi	420	1,400	.....	.....	.....	.....	180	S.L.	162	.....	.....	.....	.....
Waco Aircraft Co.	S3HD	Mil		CBL	...	PwjRi	420	S.L.	.....	.....	.....	.....	180	S.L.	160	.....	.....	.....	.....
Waco Aircraft Co.	S2HD	Mil		CBL	...	PwjRi	400	5,000	.....	.....	.....	.....	175	S.L.	158	.....	.....	.....	.....

[1] Carries 2 – 100 lb. bombs. [2] Maximum overload gross weight, 18,596 lbs. [3] Fuel load up to 400 gals. available. [4] Available in range 320–420 hp. with variable military equipment

Sikorsky XPBS-1

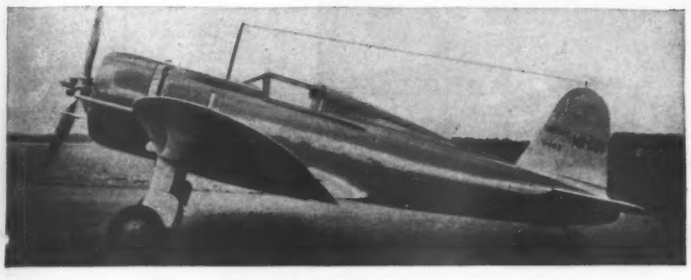


Vought V-156

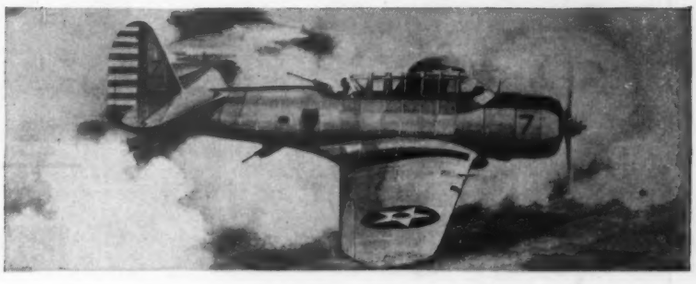


Stearman 76D1

Vultee V-12



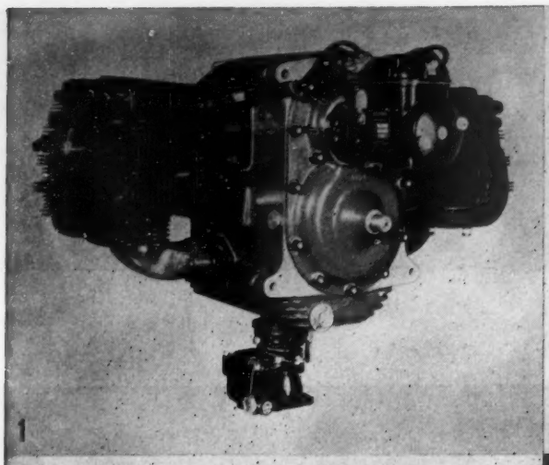
Vought V-143

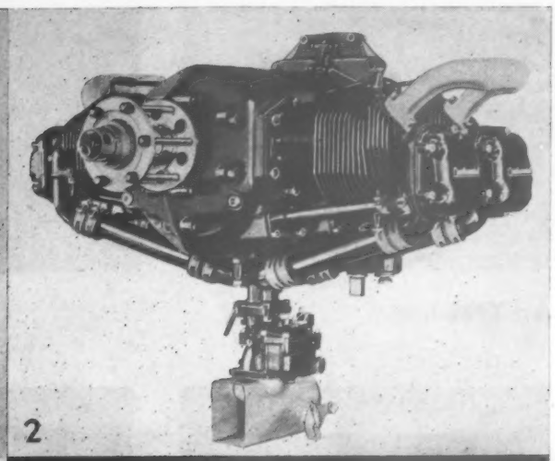


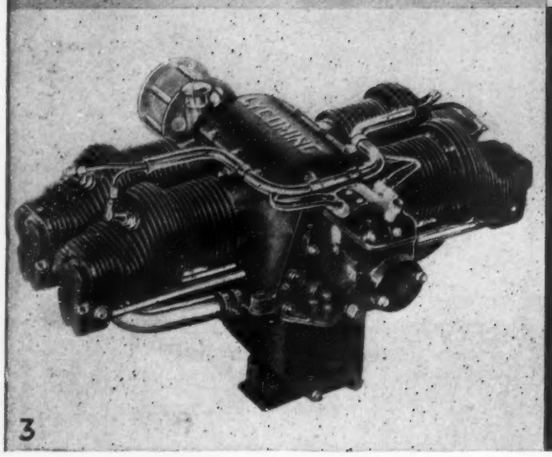
Vultee VA-19

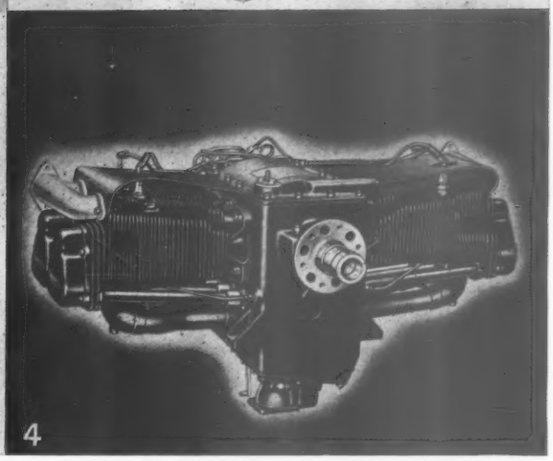
Weights				Dimensions			Area, (Sq. Ft.)						Wings			Landing Gear						Fuselage or Hull
Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
23.5	7.75	4,307	6,064	43′	27′7⅛″	8′8⅞″	255.76	20.7	5.32	14.85	24.9	21.74	D	D	D	Re	103	27″ Diam. Smooth Cont.	Hyd	Aer	Wh	ST,Wl,Me
23.5	6.43	4,164	5,400	37′	27′4½″	8′9″	230	17	5.32	14.85	24.9	21.74	D	D	D	Re	103	27″ Diam. Smooth Cont.	Hyd	Aer	Wh	ST,Wl,Me
18.56	8.39	3,395	4,611	42′	27′5⅛″	8′9″	248.2	22.4	5.46	14.57	24.7	20.38	D	D	D	Fx	95	Smooth Cont 27″ Diam	Hyd	Aer	Wh	ST,Wl,Fab
18.87	9.37	3,395	4,693	42′	27′5⅛″	8′9″	248.2	22.4	5.46	14.57	24.7	20.38	D	D	D	Fx	95	27″ Diam. Smooth Cont.	Hyd	Aer	Wh	ST,Wl,Fab
12.5	13.19	2,430	3,100	42′	27′4″	8′4¼″	248.2	22.4	5.46	14.57	24.7	20.38	D	D	D	Fx	95	24′ Diam. 8l	Hyd	Aer	Wh	ST,Wl,Fab
16.6	9.8	3,037	4,112	42′	27′5⅛″	8′8″	248.2	22.4	5.46	14.57	24.7	20.38	D	D	D	Fx	95	27″ Diam. SmoothCont.	Hyd	Aer	Wh	ST,Wl,Fab
.....	.....	1,690	2,500	36′2″	23′6″	7′8″	195	.....	.....	.....	.....	.....	AD	AD	AD	Fx	80	Aut 6.50–10	ToeHyd	Air-Ki	Pn	Stiff Skin
12.9	12.9	1,046 1,093	1,600	29′11″	21′5⅜″	6′11″	124	12.0	4.5	7.2	12.0	10.0	Sol,Sp	D	Fab	Fx	66	Go18x8-3	GoMech	Ol	Wh	D,Mo
27.3	7.9	4,791	6,687	41′	30′4″	14′4″	246.0	19.3	11.1	10.2	23.3	20.7	D	D	AD	A	.....	.....	.....	.....	.....	.....
25.7	5.21	4,405	5,730	36′	26′6″	9′9½″	223.0	19.3	10.0	9.5	18.9	16.2	D	D	AD	Re	7′10″	27″	Hyd	Ol	Ol	.....
26.7	5.5	4,445	6,022	36′	26′10″	9′9½″	225.0	19.3	10.0	9.5	18.9	16.2	D	D	AD	Re	7′10″	27″	Hyd	Ol	Ol	.....
25.2	6.5	4,279	5,563	36′	25′4″	9′9½″	220.0	19.3	10.0	9.5	18.9	16.2	D	D	AD	Re	7′10″	27″	Hyd	Ol	Ol	.....
17.9	8.57	3,440	4,953	39′	27′3″	8′4″	256	23.2	9.7	10.0	21.8	16.8	ST,Wl	Me	AD	Re	124	Go7.50–10	GoHyd	Aer	Wh	AD
15.5	9.75	2,650	3,900	39′	26′10″	8′4″	250.8	23.2	9.7	10.0	21.8	16.8	ST,Wl	Me	AD	Fx	124	Aut24″	Bx,Hyd	Aer	Wh	AD
8.83	11.67	1,938	2,626	32′2″	25′1¼″	9′2″	297.4	23.10	3.2	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Fx	74	Sl24″	Mech	Ol	Wh	ST,Wl,Fab
11.21	10.43	2,110	3,336	32′2″	24′1″	9′2″	297.4	18.74	3.14	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Fx	74½	Sl24″	Mech	Ol	Wh	ST,Wl,Fab
10.9	10.1	2,371	3,240	32′2″	24′5″	9′2″	297.4	18.74	3.2	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Fx	74½	Sl24″	Hyd	Ol	Wh	ST,Wl,Fab
11.9	8.4	2,561	3,530	32′2″	24′3″	9′2″	297.4	18.74	3.2	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Fx	74½	Sl24″	Hyd	Ol	Wh	ST,Wl,Fab
9.0	12.0	2,005	2,690	32′2″	25′1¼″	9′2″	297.4	23.1	3.2	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Fx	74½	Sl24″	Hyd	Ol	Wh	ST,Wl,Fab
10.92	8.125	2,435	3,250	32′2″	25′1¼″	9′2″	297.4	18.74	3.2	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Fx	74½	Sl24″	Hyd	Ol	Wh	ST,Wl,Fab
11.87	11	2,459	3,533	32′2″	27′9 7/16″	11′3″	297.4	18.74	3.2	11.83	24.24	14.36	Sol,Sp	Sp	Fab	Edo	(Twin Floats)					ST,Wl,Fab
16.68	7.28	3,550	5,445	33′3″	27′9¼″	10′	327.0	26.5	6.74	13.35	26.6	18.18	D,I	D	Fab	Fx	72	Bx5l27″	Bx,Hyd	Ol	Wh	ST,Wl,Fab
23.4	5.83	3,406	4,370	33′6″	26′	9′4¼″	187.0	9.96	5.85	7.06	14.90	10.24	D,Mu	D Mu	D	Re	105½	Bx5l27″	Bx,Hyd	Ol	Re	Mo,Rv,D
.....	.....	.....	6,500	42′	33′11⅜″	.....	305.3	.....	.....	.....	.....	.....	D,SM,B	D	D,Fab	Re	120½	Bx30x7	Bx,Hyd	Ol	Wh	ST,Wl,Fab
25.9	11.05	6,602	9,941	50′	37.42″	12.95′	384.0	22.7	6.15	16.55	49.6	32.8	AD,Trs	AD	AD	Re	144¾	Go	GoDisk	Ol	Re	AD,SemiMo
31.4	13.4	6,517	12,043	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
26.5	11.95	6,078	10,174	50′	37.17′	12.95′	384.0	22.7	6.15	16.55	49.6	32.8	AD,Trs	AD	AD	Re	144¾	Go	GoDisk	Ol	Re	AD,SemiMo
30.1	13.6	6,078	11,564	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	3,800	32′8⅝″	25′6½″	.....	256.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	3,800	32′8⅝″	25′6½″	.....	256.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	3,800	32′8⅝″	25′6½″	.....	256.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	3,800	32′8⅝″	25′6½″	.....	256.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

which may modify weights and performance. [5] Available in range 225–420 hp. Not available with radio, armament provisions, or photographic equipment. [9] Rm, Ri. Key — See page 41.









The 50 hp. Opposed Light Airplane Engine Group: 1. Menasco; 2. Continental; 3. Lycoming; 4. Air-Cooled

5. Latest Ranger — the SGV—770 B-5

6. Menasco Super Buccaneer

7. The Funk Ford Conversion by Akron Aircraft

8. Continental Seven Cylinder Radial

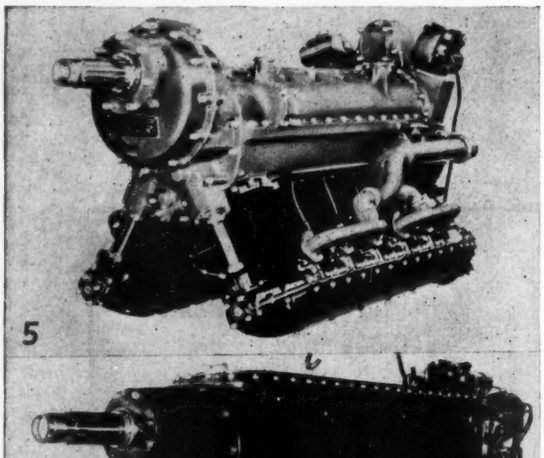
9. Jacobs Model L-6

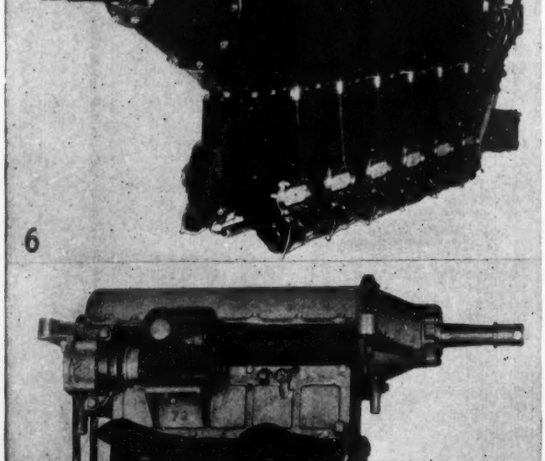
10. Lycoming R-680-B Series

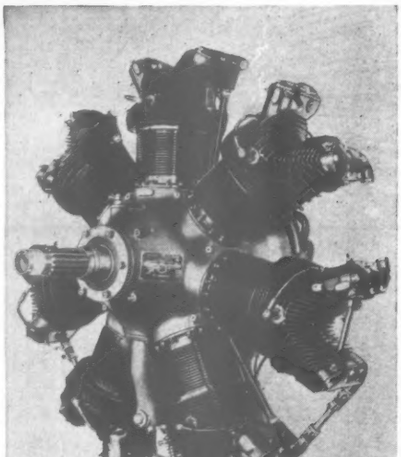
ENGINES for 1939

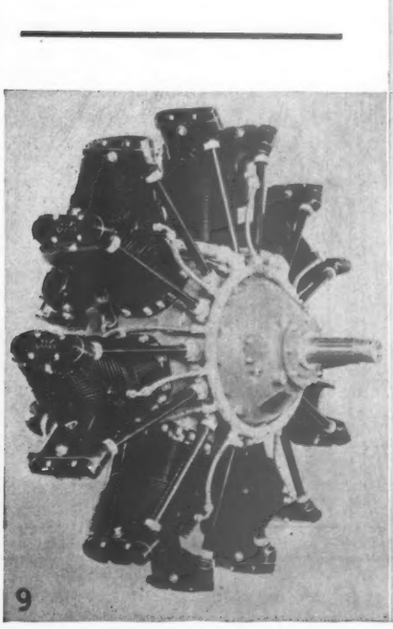
In the pictorial treatment of aircraft engines for 1939 space prevents us from presenting all the types available to the domestic and export market. The photographs on this page and on page 56 are represen-

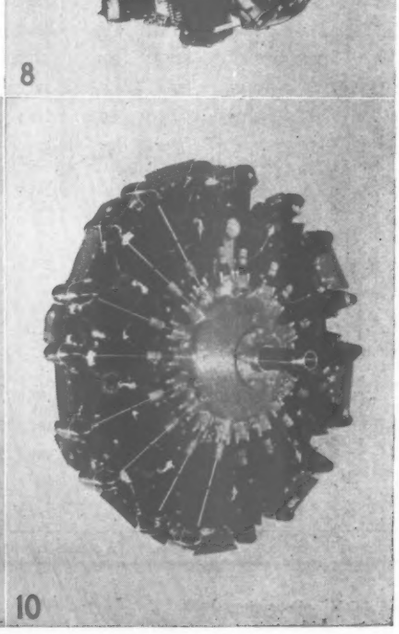
Turn to page 57











American Aircraft Engine Specifications

AVIATION does not assume responsibility for the figures given

Manufacturer	Model	Cooling system	Number of cylinders	Cylinder arrangement	Propeller drive	Rating: Rated hp.	Rating: At r.p.m.	Rating: At altitude (ft.)	Rating: Octane fuel	Weights: Total dry without hub or starter	Weights: Lb. per hp.	Bore and stroke (in.)	Displacement (cu. in.)	Compression ratio	B.M.E.P.	Blower ratio	Dimensions: Diam. mount. ring or distance between bearers	Dimensions: Ht. or O.D. (in.)	Dimensions: Length without starter	Guaranteed fuel consumption at rated hp. (lb. per hp.-hr.)	Oil consumption (lb. per hp.-hr.)	Valve[9] mechanism	Cylinder construction (See footnote)	Make spark plugs supplied with engine	Type ignition	Make ignition	Make of carburetors	Make of starter	Are exhaust manifolds provided	Shipping weight crated (lb.)	D. of C. license number
Aeronautical Corp. of America	E-113C	A	2	HOpp	D	40	2540	S.L.	73	117	2.9	4¼x4	113.5	5.4	158	.....	.....	18	24	.55	.006	prr	A1,S	Op	M	B	Sg	.....	.....	210	71
Aeronautical Corp. of America	E-113CBD	A	2	HOpp	D	45	2500	S.L.	73	125	2.8	4¼x4	113.5	5.4	181	.....	.....	18	24	.58	.006	prr	A1,S	Op	ZM	B	Sg	.....	.....	218	189
Aircooled Motors (Franklin)	4AC-150	A	4	HOpp	D	50	2300	S.L.	70	156[1]	.....	3½x3⅜	150.0	6.6	.....	.....	10[17]	18⅜	27½	.54	.002	prr	A1,NI	Op	M	Sc	Sg	.....	Yes	310	194
Akron Aircraft Co.	Funk E200-E4L	W	4	LId	D	63	2125	S.L.	70	260	3.7	3¾x4½	200.5	6.25	116.7	.....	.....	25	35	.592	.0035	Lh	C	B	M	B	Sg	.....	.....	.....	201
Allison Engrg. Co.	V-1710-C6	W	12	V	G[6]	1000	2600	S.L.	87	1280	1.28	5½x6	1710.5	6.00	178	6.75	18⅛	42[19]⅛[22]	94[19]½[22]	.60	.025	ohc[2]	A1,S	BG	DM	Sc	Sg	Ec	No	1970	177
Aviation Mfg. Corp. (Lycoming)	O-145-A1	A	4	HOpp	D	50	2300	S.L.	73	150	3.0	3.625x3.5	144.5	5.65	119	.....	[3]	19.31	23.75	.55	.010	prr	A1,Ca[4]	Ch	M	Sc	Sg	.....	No	190	199
Aviation Mfg. Corp. (Lycoming)	O-145-A2	A	4	HOpp	D	55	2300	S.L.	73	162.6	2.96	3.625x3.5	144.5	5.65	131	.....	[3]	19.31	24.63	.55	.010	prr	A1,Ca[4]	Ch	ZM	Sc	Sg	Ec	No	218	199
Aviation Mfg. Corp. (Lycoming)	O-145-A3	A	4	HOpp	D	55	2300	S.L.	73	165	3.0	3.625x3.5	144.5	5.65	131	.....	[3]	22.13	24.63	.55	.010	prr	A1,Ca[4]	Ch	ZM	Sc	Sg	Ec	No	221	199
Aviation Mfg. Corp. (Lycoming)	R-530-D1	A	7	Rad	D	220	2300	S.L.	80	430	1.96	4.625x4.5	529.2	6.5	143	1	19.25	43.5	34.26	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	925	182
Aviation Mfg. Corp. (Lycoming)	R-530-D2	A	7	Rad	D	210	2300	S.L.	73	430	2.05	4.625x4.5	529.2	5.5	137	1	19.25	43.5	34.26	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	925	183
Aviation Mfg. Corp. (Lycoming)	R-680-B4C	A	9	Rad	D	225	2100	S.L.	73	472	2.19	4.625x4.5	680.4	5.5	125	1	19.25	43.5	37.03	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	1000	108
Aviation Mfg. Corp. (Lycoming)	R-680-D5	A	9	Rad	D	260	2300	S.L.	80	516	1.99	4.625x4.5	680.4	6.5	131	1	19.25	43.5	37.04	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	1025	172
Aviation Mfg. Corp. (Lycoming)	R-680-D6	A	9	Rad	D	245	2300	S.L.	73	516	2.11	4.625x4.5	680.4	5.5	124	1	19.25	43.5	37.04	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	1025	173
Aviation Mfg. Corp. (Lycoming)	R-680-E1	A	9	Rad	D	290	2300	S.L.	80	525	1.81	4.625x4.5	680.4	6.2	147	1	19.25	43.5	37.04	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	1060	202
Aviation Mfg. Corp. (Lycoming)	R-680-E2	A	9	Rad	D	280	2300	S.L.	73	525	1.86	4.625x4.5	680.4	5.5	142	1	19.25	43.5	37.04	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ec	No	1060	202
Aviation Mfg. Corp. (Lycoming)	R-680-E3	A	9	Rad	D	300	2300	S.L.	87	525	1.75	4.625x4.5	680.4	7.0	152	1	19.25	43 5	37.04	.52	.025	prr	A1,S	BG	DM	Sc	Sg	Ee	No	1060	202
Continental Motors Corp.	A-40-4	A	4	HOpp	D	40	2575	S.L.	65	143	3.80	3½x3¾	110.5	5:20	108	.....	[8]	20⅝[16]	28	.70	.025	Lh	A1,NI	Op	M	B,Sc	Sg	.....	No	255	72
Continental Motors Corp.	A-40-5	A	4	HOpp	D	40	2575	S.L.	65	156	3.90	3½x3¾	115.0	5.20	108	.....	[8]	20⅝[16]	28	.70	.025	Lh	A1,NI	Op	ZM	Sc	Sg	.....	No	265	174
Continental Motors Corp.	A-50-1-2-3	A	4	HOpp	D	50	1900	S.L.	...	155	3.10	3½x3½	171.0	5.40	122	.....	[8]	23	30[13]½[22]	.55	.02	prr	A1,S	BG	Op	Sc	Sg	Op	No	360[21]	.....
Continental Motors Corp.	W-670-K	A	7	Rad	D	225	2175	S.L.	65	450	2.00	5½x4½	668.0	5.40	122	.....	20	42½	34½[16]	.57	.02	prr	A1,S	BG	ZM	Sc	Sg	Op	No	850	162
Continental Motors Corp.	W-670-K-1	A	7	Rad	D	230	2175	S.L.	65	460	2.00	5½x4½	668.0	5.40	127	.....	20	42½	34¾[16]	.57	.02	prr	A1,S	BG	ZM	Sc	[7]	Op	No	850	168
Continental Motors Corp.	W-670-M	A	7	Rad	D	240	2200	S.L.	80	450	1.90	5½x4½	668.0	6.10	129	.....	20	42½	34¾[16]	.54	.02	prr	A1,S	BG	ZM	Sc	Sg[7]	Op	No	850	162
Continental Motors Corp.	W-670-M-1	A	7	Rad	D	250	2200	S.L.	80	460	1.80	5½x4½	668.0	6.10	135	.....	20	42¾	34¾[16]	.54	.02	prr	A1,S	BG	ZM	Sc	Sg[7]	Op	No	850	168
Guiberson Diesel Engine Co.	A-900	A	9	Rad	D	210	2000	S.L.	[8]	509	2.32	4¼x4x6	982.0	14.70	85	.....	19¼	46	34	.44	.025	prr	.....	.....	.....	.....	.....	Ee	.....	.....	79
Guiberson Diesel Engine Co.	A-918	A	9	Rad	D	250	2050	S.L.	...	549	2.20	4½x5¾	918.0	16.00	105	.....	19¼	49	35	.43	.025	prr	.....	.....	.....	.....	.....	Ee	.....	.....	.....
Guiberson Diesel Engine Co.	A-1020	A	9	Rad	D	320	2200	S.L.	...	620	1.94	5½x5½	1021.0	15.00	113	.....	20	47	36⅞[16]	.395	.020	prr	.....	.....	.....	.....	.....	Ee	.....	.....	.....
Jacobs Aircraft Engine Co.	L-4	A	7	Rad	D	225	2000	S.L.	73	485[9]	2.15	5½x5	757.0	5.38	118	.....	16½	43½	36[13]½[16]	.55	.018	prr	A1,S	BG	2 Bat	Sc	Sg	Ee	No	900	121
Jacobs Aircraft Engine Co.	L-4M	A	7	Rad	D	225	2000	S.L.	73	490[9]	2.17	5½x5	757.0	5.38	118	.....	16½	43½	36[9]½[22]	.55	.018	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	900	121
Jacobs Aircraft Engine Co.	L-4MB	A	7	Rad	D	225	2000	S.L.	73	494[9]	2.20	5½x5	757.0	5.38	118	.....	16½	43½	36[9]½[22]	.55	.018	prr	A1,S	BG	1M	Sc	Sg	Ee	No	900	121
Jacobs Aircraft Engine Co.	L-4MA7	A	7	Rad	D	225	2000	S.L.	73	493[9]	2.19	5½x5	757.0	5.38	118	.....	16½	43½	36½	.55	.018	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	900	121
Jacobs Aircraft Engine Co.	L-5	A	7	Rad	L	285	2000	S.L.	73	510[9]	1.79	5½x5	831.0	6.00	136	.....	16½	43½	36[13]½[16]	.53	.018	prr	A1,S	BG	2 Bat	Sc	Sg	Ee	No	925	156
Jacobs Aircraft Engine Co.	L-5M	A	7	Rad	D	285	2000	S.L.	73	521[9]	1.82	5½x5	831.0	6.00	136	.....	16½	43½	36[9]½	.53	.018	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	925	156
Jacobs Aircraft Engine Co.	L-5MB	A	7	Rad	D	285	2000	S.L.	73	525[9]	1.84	5½x5	831.0	6.00	136	.....	16½	43½	37[9]½[22]	.53	.018	prr	A1,S	BG	1M	Sc	Sg	Ee	No	925	156
Jacobs Aircraft Engine Co.	L-5MA7	A	7	Rad	D	285	2000	S.L.	73	527[9]	1.85	5½x5	831.0	6.00	136	.....	16½	43½	36½	.53	.018	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	925	156
Jacobs Aircraft Engine Co.	L-6	A	7	Rad	D	300	2100	3700	80	535[9]	1.62	5½x5½	914.0	6.00	140	.....	16½	45⅝	38[9]½	.45	.025	prr	A1,S	BG	2 Bat	Sc	Sg	Ee	No	975	195
Jacobs Aircraft Engine Co.	L-6M	A	7	Rad	D	300	2100	3700	80	550[9]	1.66	5½x5½	914.0	6.00	140	.....	16½	45⅝	38[9]½[22]	.45	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	975	195
Jacobs Aircraft Engine Co.	L-6MB	A	7	Rad	D	300	2100	3700	80	550[9]	1.66	5½x5½	914.0	6.00	140	.....	16½	45⅝	37[9]½[22]	.45	.025	prr	A1,S	BG	1M	Sc	Sg	Ee	No	975	195
Jacobs Aircraft Engine Co.	L-6MA	A	7	Rad	D	300	2100	3700	80	550[9]	1.66	5½x5½	914.0	6.00	140	.....	16½	45⅝	38½	.45	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	975	195
Ken-Royce Aircraft Engine Co.	5-E	A	5	Rad	D	70	1950	S.L.	73	242	3.46	4¼x3¾	250.5	5.40	116	.....	.....	33¼	23¾	.60	.015	prr	C	Ch	ZM	Bndx	Sg	Ee	No	.....	48
Ken-Royce Aircraft Engine Co.	5-F	A	5	Rad	D	90	2250	S.L.	73	220	2.44	4¼x3¾	266.0	6.00	120	.....	.....	33¼	23¾	.55	.015	prr	A1,S	Ch	ZM	Bndx	Sg	Ee	No	.....	46
Ken-Royce Aircraft Engine Co.	7-DF	A	7	Rad	D	110	2150	S.L.	73	275	2.50	4¼x3¾	372.0	5.40	112	.....	.....	33¼	24¼	.54	.015	prr	A1,S	Ch	ZM	Sc	Sg	Ee	No	.....	52
Kinner Airplane & Motor Corp.	K-5	A	5	Rad	D	100	1810	S.L.	73	275	2.75	4¼x5½	372.0	5.00	118	.....	14	45¾	32½[10]	.55	.025	prr	A1,S	BG	ZM	B,Sc	Hy,Sg	Ee	Yes	550	3
Kinner Airplane & Motor Corp.	B-5	A	5	Rad	D	125	1925	S.L.	73	295	2.36	4¼x5½	441.0	5.25	117	.....	14	45¾	32½[10]	.55	.025	prr	A1,S	BG	ZM	B,Sc	Hy,Sg	Ee	Yes	570	51
Kinner Airplane & Motor Corp.	R-5-I	A	5	Rad	D	160	1975	S.L.	73	314	1.96	4¼x5¾	490.0	5.00	130	.....	14	45¾	32½[10]	.55	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	Yes	590	77
Kinner Airplane & Motor Corp.	R-5-II	A	5	Rad	D	160	1850	S.L.	73	330	2.06	5x5½	540.0	5.50	127	.....	14	45[13]½[16]	32½[10]	.55	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	Yes	615	153
Kinner Airplane & Motor Corp.	C-5	A	5	Rad	D	210	1900	S.L.	73	420	2.00	5½x5¾	715.0	5.25	122	.....	19¼	50	36[16]¾	.55	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	Yes	1000	62
Kinner Airplane & Motor Corp.	C-7	A	7	Rad	D	300	1800	S.L.	73	630	2.10	5½x6	1044.0	5.25	126	.....	20	48¾	45[13]½[22]	.55	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	Yes	1100	122
Kinner Airplane & Motor Corp.	SC-7	A	7	Rad	D	350	1900	5000	73	650	1.85	5½x6	1044.0	5.25	148	9.33	20	47¾	45[13]½[22]	.55	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	Yes	1150	175
Lenape Aircraft & Motors, Inc.	AR-3	A	3	Rad	D	50	2125	S.L.	73	150	3.00	4¼x4	160.0	5.00	120	.....	12½	34¼	23[13]½[16]	.55	.009	prr	A1,S	BG	M	B	Sg	.....	No	340	74
Lenape Aircraft & Motors, Inc.	AR-340	A	3	Rad	D	40	2050	S.L.	73	150	3.75	4½x4	160.0	5.00	115	.....	12½	34¼	23[13]½[16]	.55	.010	prr	A1,S	E8	M	B	Sg	.....	No	340	119
Menasco Mfg. Co.	M-50	A	4	HOpp	D	50	2500	S.L.	73	164	3.2	3½x3¾	144.4	5.50	110	.....	[10]	20[13]½[22]	29[7]½[22]	.65	.025	LH	A1,NI	BG	1 or 2	Sc	Sg	.....	No	265	191
Menasco Mfg. Co.	B4-Pirate	A	4	LId	D	95	2000	S.L.	73	290	3.05	4½x5½	326.0	5.50	115	.....	11¾	28[9]⅛	47[13]¾[16]	.54	.015	prr	A1,NI	BG	ZM	B,Sc	Sg	Ee	No	448	65
Menasco Mfg. Co.	C4-Pirate	A	4	LId	D	125	2175	S.L.	73	300	2.4	4½x5½	363.0	5.50	125	.....	11¾	28[9]⅛	47[13]¾[16]	.50	.015	prr	A1,NI	BG	ZM	B,Sc	Sg	Ee	No	450	67
Menasco Mfg. Co.	C4S-Pirate	A	4	LId	D	150	2260	3000	80	320	2.13	4½x5½	363.0	5.50	144	9.66	11¾	28[9]⅛	47[13]¾[16]	.55	.025	prr	A1,NI	BG	ZM	B,Sc	Sg	Ee	No	460	134
Menasco Mfg. Co.	B6-Buccaneer	A	6	LId	D	160	1975	S.L.	73	398	2.48	4½x5½	489.0	5.50	131	.....	11⅞	28[9]⅛	50[13]½	.54	.015	prr	A1,NI	BG	ZM	B	Sg	Ee	No	630	66
Menasco Mfg. Co.	B6S-Buccaneer	A	6	LId	D	200	2250	4500	80	423	2.11	4½x5½	489.0	5.50	146	8.75	11⅞	28[9]⅛	60¼	.57	.025	prr	A1,NI	BG	ZM	B	Sg	Ee	No	683	139
Menasco Mfg. Co.	C6S-4-Super Buccaneer	A	6	LId	D	260[11]	2300	7500	80	550	2.12	4¾x5½	544.9	5.50	164[12]	10.90	13.5	30[9]⅛	71¼	.55	.025	prr	A1,S	BG	ZM	Sc	Sg	Ee	No	870	197
Milwaukee Parts Corp.	V-470	A	8	V	D	115	1650	S.L.	...	398	3.18	3¼x5	470.0	5.45	118	.....	12¾	32	52	.52	.008	prr	C	B	ZM	Sc	Z	Op	Yes	540	63
Milwaukee Parts Corp.	V-502	A	8	V	D	115	1650	S.L.	...	397	3.18	3¼x5	470.0	5.45	118	.....	12¾	32	52	.52	.058	prr	C	B	ZM	ScBe	Z	Op	Yes	540	73
Milwaukee Parts Corp.	70	A	4	LId	D	60	2000	S.L.	73	198	3.3	3¼x4½	200.0	6.25	114	.....	10	26	40[13]½	.58	.017	ohc	A1,NI	B	ZM	Sc	Sg	Op	No	300	.....
Monocoupe Corporation	Lambert R-366	A	5	Rad	D	90	2375	S.L.	72	222	2.47	4¼x3¾	266.0	5.55	.....	.....	13¾	34¼	30¾	.55	.025	prr	NS	Ch	M	Sc	Sg	Ee	No	421	38
Pratt & Whitney Aircraft	Wasp, Jr. SB	A	9	Rad	D	400[18]	2200	5000	80	640[14]	1.42[18]	5½ax5½	985.0	6.00	157[18]	10.00	23⅛	45⅜	41[19]½	.465[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	123
Pratt & Whitney Aircraft	Wasp, Jr. TB	A	9	Rad	D	420[17]	2200	S.L.	80	640[14]	1.52[18]	5½ax5½	985.0	6.00	154[18]	8.00	23⅛	45⅜	41[19]½	.465[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	85
Pratt & Whitney Aircraft	Wasp 81H1	A	9	Rad	D	550[18]	2280	8000	87	864[14]	1.44[18]	5¼x5¾	1344.0	6.00	157[18]	12.00	23⅛	51⅞[16]	42[15]¼	.475[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	Pdg
Pratt & Whitney Aircraft	Wasp 81H1-G	A	9	Rad	GI	550[18]	2200	8000	87	930[14]	1.55[18]	5¼x5¾	1344.0	6.00	157[18]	12.00	23⅛	51⅞[16]	47[19]½[22]	.475[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	129
Pratt & Whitney Aircraft	Wasp 82H1	A	9	Rad	D	500[18]	2200	10500	80	864[14]	1.44[18]	5¼x5¾	1344.0	6.00	157[18]	12.00	23⅛	51⅞[16]	42[15]¼	.481[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	163
Pratt & Whitney Aircraft	Wasp 82H1-G	A	9	Rad	GI	500[18]	2200	10500	80	930[14]	1.55[18]	5¼x5¾	1344.0	6.00	157[18]	12.00	23⅛	51⅞[16]	47[19]½[22]	.481[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	141
Pratt & Whitney Aircraft	Wasp 83H1	A	9	Rad	D	550[18]	2200	5000	80	864[14]	1.44[18]	5¼x5¾	1344.0	6.00	157[18]	10.00	23⅛	51⅞[16]	42[15]¼	.465[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	143
Pratt & Whitney Aircraft	Wasp 83H1-G	A	9	Rad	GI	550[18]	2200	5000	80	930[14]	1.55[18]	5¼x5¾	1344.0	6.00	157[18]	10.00	23⅛	51⅞[16]	47[19]½[22]	.465[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	142
Pratt & Whitney Aircraft	Hornet 81E	A	9	Rad	D	750[18]	2250	7000	87	975[14]	1.18[18]	6¼x6¾	1690.0	6.50	178[18]	12.00	23⅛	54½[16]	43[15]½[22]	.465[18]	.025[18]	prr	A1,S	Op	ZM	Sc	Sg	Op	No	.....	Mil

(Turn to page 56)

Manufacturer	Model	Cooling system	Number of cylinders	Cylinder arrangement	Propeller drive	Rating: Rated hp.	Rating: At r.p.m.	Rating: At altitude (ft.)	Rating: Octane fuel	Weights: Total dry without hub or starter	Weights: Lb./per hp.	Bore and stroke (in.)	Displacement (cu. in.)	Compression ratio	B.M.E.P.	Blower ratio	Dimensions: Diam. mount. ring or distance between bearers	Dimensions: Ht. or O.D. (in.)	Dimensions: Length without starter	Guaranteed fuel cons. sumption at rated hp. (lb. per hp. hr.)	Oil consumption (lb. per hp.-hr.)	Valve* mechanism	Cylinder construction (See footnote)	Make spark plugs supplied with engine	Type ignition	Make ignition	Make of carburetors	Make of starter	Are exhaust manifolds provided	Shipping weight crated (lb.)	D. of C. license number
Pratt & Whitney Aircraft	Hornet S1E2G-[1]	A	9	Rad	G1	750[20]	2250	7000	87	1070	1.22[19]	6¼x6¾	1690.0	6.50	178[19]	10.00	23¾	54⅞	49[43]/64	.465[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	193
Pratt & Whitney Aircraft	S2E-G	A	9	Rad	G1	750[21]	2250	2500	87	1064	1.33[18]	6¼x6¾	1690.0	6.00	163[19]	10.00	23¾	54⅞	49½	.465[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	144
Pratt & Whitney Aircraft	S5E	A	9	Rad	D	700	2050	6000	80	975	1.39[19]	6¼x6¾	1690.0	6.50	160[19]	12.00	23¾	54⅞	43[31]/32	.465[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	164
Pratt & Whitney Aircraft	Twin Wasp Jr 8B4-G	A	14	Rad-8	G1[22]	750[22]	2550	9500	87	1116	1.37[19]	5½ex5¾/16	1535.0	6.75	163	11.00	23¾	44¼	53[17]/64	.465[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	179
Pratt & Whitney Aircraft	Twin Wasp SC3-G	A	14	Rad-8	G1[24]	900	2550	12000	87	1413	1.35[19]	5½x5½	1830.0	6.70	168	7.15	23¾	48	59[13]/16	.465[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	....
Pratt & Whitney Aircraft	Twin Wasp S1C3-G	A	14	Rad-8	G1[24]	1050[20]	2550	7500	100	1413	1.18[19]	5½x5½	1830.0	6.70	193	7.15	23¾	48	59[13]/16	.457[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	....
Pratt & Whitney Aircraft	Twin Wasp S3C3-G	A	14	Rad-8	G1[24]	950[27]	2700	14300	100	1413	1.29	5½x5½	1830.0	6.70	176	8.00	23¾	48	59[13]/16	.48[18]	.025[16]	prr	A1,8	Op	ZM	Se		Op	No	....	....
Rearwin Airplanes	5-E	A	5	Rad	D	70	1950	S.L.	65	242	3.46	4¼x3¾	250.5	5.40	116	....	....	33¼	23¾	.60	.015	prr	C	Ch	ZM	Se		Eo	No	....	Mil
Rearwin Airplanes	5-F	A	5	Rad	D	90	2250	S.L.	65	220	2.44	4¼x3¾	266.0	6.00	120	....	....	33¼	23¾	.55	.015	prr	A1,8	Ch	ZM	Se		Eo	No	....	48
Rearwin Airplanes	7-DE	A	7	Rad	D	110	2150	S.L.	65	275	2.50	4¼x3¾	372.0	5.40	112	....	....	33¼	24½	.54	.015	prr	A1,8	Ch	ZM	Se		Eo	No	....	52
Ranger Engineering Corp.	6-410 B-2	A	6	LId	D	165	2450	S.L.	80	345	2.10	4½x5½	410.9	6.50	130	....	[28]	31[17]/32	50½	.50	.015	ohe	A1,8	BG	M			Op	No	....	187
Ranger Engineering Corp.	V-770 B-4	A	12	VId	D	305[20]	2300	S.L.	80	565	1.85	4x5½	772.8	6.50	136	....	15½	27¾	61	.50	.015	ohe	A1,8	BG	M			Op	No	....	184
Ranger Engineering Corp.	SGV-770 B-5	A	12	VId	G1	420[21]	2800	3000	87	640	1.52	4x5½	772.8	6.00	154	8.84	[28]	32¾	61[5]/16	.49	.025	ohe	A1,8	BG	M			Op	No	....	185
Security Aircraft Corp.	S1-125	A	5	Rad	D	125	1950	S.L.	74	325	2.40	4.75x5	440.5	5.00		....	16⅞	40	24	.55	.015	prr	....	B	Bat	Op	Own[1]	Op	No	450	181
Warner Aircraft Corporation	Super Scarab	A	7	Rad	D	145	2050	S.L.	73	305	2.10	4½x4¼	499.0	5.30	115	....	17	36[9]/16	28[13]/32	.55	.025	prr	A1,8	BG	5M	Se		Eo	No	....	104
Warner Aircraft Corporation	Scarab	A	7	Rad	D	125	2050	S.L.	73	285	2.20	4½x4¼	422.0	5.20	115	....	17	36[9]/16	28[13]/32	.55	.025	prr	A1,8	AC	5M	Se		Eo	No	....	2
Warner Aircraft Corporation	Scarab Junior	A	5	Rad	D	90	2025	S.L.	73	235	2.61	4.462x4½	301.0	5.20	115	....	17	36[9]/16	28[13]/32	.55	.025	prr	A1,8	Ch	M	Se	H[3]	Eo	No	....	54
Welch Aircraft Industries, Inc.	Welch O-2	A	2	Opp	D	45	2500	S.L.		115	2.4	4½x4¼	135.0	5.20																	
Wright Aeronautical Corp.	R-760-E1	A	7	Rad	D	285	2100	S.L.	73	570	2.0	5x5½	756.0	6.10	142	7.05	19¼	45	42¾	.55	.020	prr	C	....	M	Wi		Wi	No	....	....
Wright Aeronautical Corp.	R-760-ET	A	7	Rad	D	235	2000	S.L.	73	515	2.20	5x5½	756.0	6.10	123	....	19¼	45	42¾	.55	.020	prr	A1,8	BG	ZM	Se		Op	Yes	1065	94
Wright Aeronautical Corp.	R-760-E2	A	7	Rad	D	320	2200	S.L.	80	570	1.78	5x5½	756.0	6.30	152	9.17	19¼	45	42¾	.55	.020	prr	A1,8	BG	ZM	Se		Op	Yes	1025	126
Wright Aeronautical Corp.	R-975-E1	A	9	Rad	D	365	2100	S.L.	73	660	1.81	5x5½	973.0	6.10	141	7.80	19¼	45	43½	.55	.020	prr	A1,8	BG	ZM	Se		Op	Yes	1080	155
Wright Aeronautical Corp.	R-975-E3	A	9	Rad	D	420	2200	1400	80	675	1.6	5x5½	973.0	6.30	155	10.15	19¼	45	43½	.55	.020	prr	A1,8	BG	ZM	Se		Op	Yes	1200	87
Wright Aeronautical Corp.	R-1820-F52	A	9	Rad	G3	775	2100	5800	87	990	1.25	6¼x6⅞	1823.0	6.40	160	7.00	23¾	54⅛	43¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	Yes	1200	125
Wright Aeronautical Corp.	GR-1820-F52	A	9	Rad	G3	760	2100	5800	87	1085	1.41	6¼x6⅞	1823.0	6.40	157	7.00	23¾	54½	47⅞	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1700	148
Wright Aeronautical Corp.	R-1820-F53	A	9	Rad	D	745	2100	9600	87	990	1.31	6¼x6⅞	1823.0	6.40	154	8.31	23¾	54⅛	43¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1700	149
Wright Aeronautical Corp.	GR-1820-F53	A	9	Rad	G3	730	2100	9600	87	1085	1.47	6¼x6⅞	1823.0	6.40	151	8.31	23¾	54⅛	47⅞	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1700	149
Wright Aeronautical Corp.	R-1820-F54	A	9	Rad	D	690	2100	15300	87	990	1.41	6¼x6⅞	1823.0	6.40	142	10.00	23¾	54⅛	43¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1800	149
Wright Aeronautical Corp.	GR-1820-F54	A	9	Rad	G3	675	2100	15300	87	1085	1.59	6¼x6⅞	1823.0	6.40	139	10.00	23¾	54⅛	47⅞	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1700	150
Wright Aeronautical Corp.	R-1820-F56	A	9	Rad	D	755	2100	11300	87	990	1.29	6¼x6⅞	1823.0	6.40	156	8.83	23¾	54⅛	43¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1800	150
Wright Aeronautical Corp.	GR-1820-F56	A	9	Rad	G3	740	2100	11300	87	1085	1.45	6¼x6⅞	1823.0	6.40	153	8.83	23¾	54⅛	47⅞	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1700	159
Wright Aeronautical Corp.	GR-1820-F62	A	9	Rad	G3	760	2100	5800	87	1085	1.41	6¼x6⅞	1823.0	6.40	157	7.00	23¾	54⅛	47⅞	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1800	159
Wright Aeronautical Corp.	GR-1820-G2	A	9	Rad	G3	850	2100	5800	87	1183	1.40	6¼x6⅞	1823.0	6.45	176	7.00	23¾	54¼	47¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1800	148
Wright Aeronautical Corp.	GR-1820-G3	A	9	Rad	G3	840	2100	8700	87	1183	1.40	6¼x6⅞	1823.0	6.45	173	8.31	23¾	54¼	47¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1950	157
Wright Aeronautical Corp.	GR-1820-G3B	A	9	Rad	G3	820	2100	8800	87	1183	1.40	6¼x6⅞	1823.0	6.2:1	170	8.31	23¾	54¼	47¾	.60	.025	prr	A1,8	BG	ZM	Se		Op	No	1950	171
Wright Aeronautical Corp.	GR-1820-G102A	A	9	Rad	G3	900	2300	6700	90	1260	1.4	6¼x6⅞	1823.0	6.3:1	170	7.0:1	23¾	55.1	48.12	.67	.025	prr	A1,8	Op	ZM	Se	Se,CG	Op	No	2050	169
Wright Aeronautical Corp.	GR-1820-G103A	A	9	Rad	G3	860	2300	11100	90	1260	1.46	6¼x6⅞	1823.0	6.3:1	163	8.31:1	23¾	55.1	48.12	.67	.025	prr	A1,8	Op	ZM	Se	Se,CG	Op	No	2050	180
Wright Aeronautical Corp.	R-1820-F55[23]	A	9	Rad	D	675	2100	15300	87	1012	1.5	6¼x6⅞	1823.0	6.4:1	140	10.00	23¾	54.09	45.38	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	198
						760	2100	5800			1.33				157	7.14														
Wright Aeronautical Corp.	GR-1820-F55[23]	A	9	Rad	G3	675	2100	15300	87	1107	1.64	6¼x6⅞	1823.0	6.4:1	140	10.00	23¾	54.09	47.81	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	198
						760	2100	5800			1.46				157	7.14														
Wright Aeronautical Corp.	GR-1820-F65[23]	A	9	Rad	G3	675	2100	15300	87	1107	1.64	6¼x6⅞	1823.0	6.4:1	140	10.00	23¾	54.09	47.81	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	198
						760	2100	5800			1.46				157	7.14														
Wright Aeronautical Corp.	R-1820-G5[23]	A	9	Rad	D	750	2100	15200	87	1115	1.49	6¼x6⅞	1823.0	6.45:1	155	10.00	23¾	54.25	48.25	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	154
						850	2100	6000			1.31				176	7.14														
Wright Aeronautical Corp.	GR-1820-G5[23]	A	9	Rad	G3	750	2100	15200	87	1210	1.61	6¼x6⅞	1823.0	6.45	155	10.00	23¾	54.25	47.75	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	154
						850	2100	6000			1.42				176	7.14														
Wright Aeronautical Corp.	GR-1820-G105A[23]	A	9	Rad	G3	750	2300	18000	90	1272	1.7	6¼x6⅞	1823.0	6.30	141	10.00	23¾	55.10	48.12	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	....
						900	2300	6500			1.41				170	7.14														
Wright Aeronautical Corp.	GR-1820-G108A	A	9	Rad	G3	750	2300	18000	90	1272	1.7	6¼x6⅞	1823.0	6.30	141	10.00	23¾	55.10	48.12	.67	.025	prr	A1,8	Op	ZM	Se	Se	Op	No	....	....
						860	2300	10500			1.48				163	8.37														
Wright Aeronautical Corp.	GR-2600-A2	A	14	Rad-8	G1	1200	2100	5400	95	1875	1.56	6¼x6½/16	2603.0	6.85	174	7.4	23¾	55.0	62.06	.65	.030	prr	A1,8	Op	ZM	Se	CG	Op	No	2850	176
Wright Aeronautical Corp.	GR-2600-A2A	A	14	Rad-8	G6	1350	2300	5000	95	1900	1.41	6¼x6½/16	2603.0	6.85	178	7.0	23¾	55.0	62.06	.73	.030	prr	A1,8	Op	ZM	Se	CG	Op	No	2875	....
Wright Aeronautical Corp.	GR-2600-A5A	A	14	Rad-8	G6	1275	2300	12000	95	1920	1.50	6¼x6½/16	2603.0	6.85	168	10.00	23¾	55.0	62.06	.80	.030	prr	A1,8	Op	ZM	Se	CG	Op	No	2895	....
						1350	2300	5000			1.42				178	7.14														

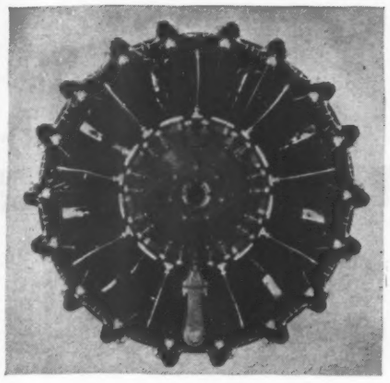
Footnotes

A —Air cooled
Al —Aluminum
Apl—Applied for
B —Bosch
Bat—Battery ignition
Be —Berling
C —Cast Iron
CG —Chandler-Groves
Ch —Champion
D —Direct
DM—Dual magneto
Ec —Eclipse
ES —Edison Splitdorf
G —Geared
G1 —3:2 reduction gear
G2 —4:3 reduction gear
G3 —16:11 reduction gear
G4 —7:5 reduction gear
G5 —2:1 reduction gear
G6 —16:9 reduction gear
H —Horisontal
Hy —Holley
Id —Inverted
L —Cylinders in line
Lh —"L" head
M —Magneto
Ni —Nickel iron
Op —Optional
Opp —Opposed
Ohc —Overhead cam
Pdg —Pending
prr —Push rods and rocker arms
Rad —Radial
Rad S —Staggered radial
S.L.—Sea level
Sc —Scintilla
Sg —Stromberg
S —Steel
V —Vee
W —Liquid cooled
Z —Zenith

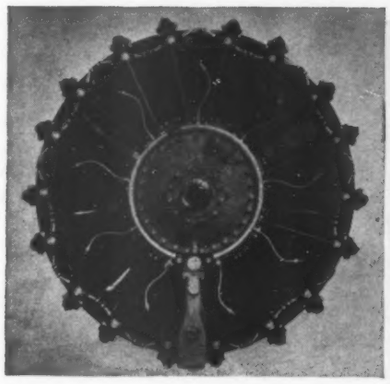
* All engines, unless otherwise specified, equipped with single intake valve.

1. Includes propeller hub assembly.
2. Two intake valves per cylinder.
3. 8.5 in. wide x 10.25 in. long.
4. Cast iron alloy.
5. 8.5 in. horisontal; 10⅝ in. vertical.
6. 7 in. wide upper, 10½ in. wide lower, 11⅜ in. high.
7. Marvel injector.
8. Diesel fuel.
9. Weight includes 15 amp. generator and control box weighing 17½ lbs.
10. 8½ in. horisontal top, 9½ in. horisontal bottom, 10¾ in. vertical, 4 bolts in rear of crankcase.
11. Take off rating C6S-4, 290 hp. at 2400 r.p.m. at 44 in. HG manifold pressure with 87 octane fuel.
12. 175 take off.
13. 450 hp. at 2300 r.p.m. for take off on 87 octane fuel.
14. This weight includes all standard running equipment.
15. Guaranteed within 3% at maximum cruising power.
16. Maximum at rated power.
17. 440 hp. at 2300 r.p.m. for take off.
18. 600 hp. at 2250 r.p.m. for take off on 87 octane fuel.
19. At take off power.
20. 875 hp. at 2300 r.p.m. / 850 hp. at 2500 r.p.m. } for take off.
21. 800 hp. at 2300 r.p.m. for take off.
22. 4:3 optional.
23. 825 hp. at 2625 r.p.m. for take off.
24. 2:1 or 16:9 optional.
25. With 2:1 gear — 1438 lbs., with 16:9 gear — 1450 lbs.
26. 1200 hp. at 2700 r.p.m. for take off.
27. 1100 hp. at 2700 r.p.m. for take off.
28. 15 in. front, 17 in. rear.
29. 15½ in. front, 19½ in. rear.
30. 915 hp. available for take off at 2400 r.p.m.
31. Two speed super charger.

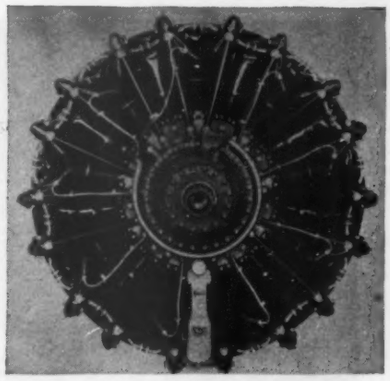
32-Jacobs models L-4MB, L-5MB, L-6MB have 1 Mag and 1 Bat.



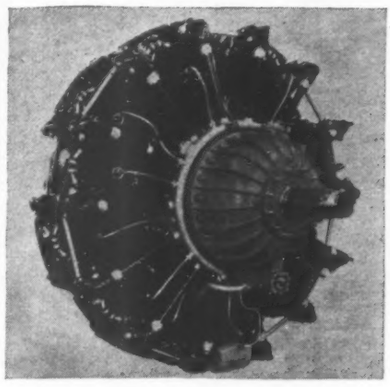
Pratt & Whitney Wasp Junior



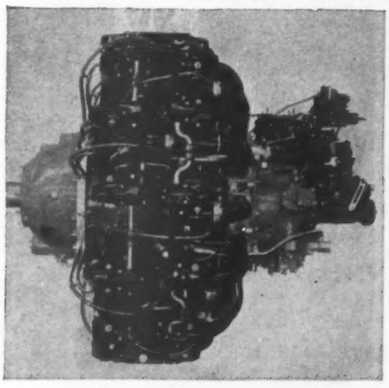
Pratt & Whitney Direct Drive H, Wasp



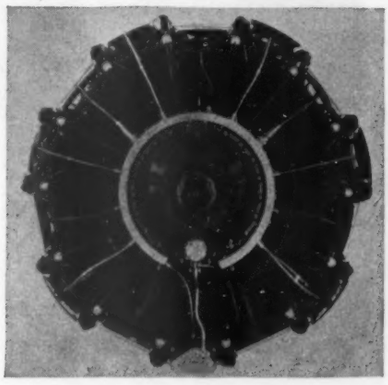
Pratt & Whitney E Hornet (geared)



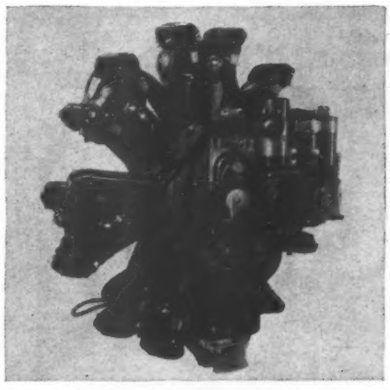
Pratt & Whitney Twin Wasp Junior



Pratt & Whitney Twin Wasp C-3



Pratt & Whitney Twin Hornet

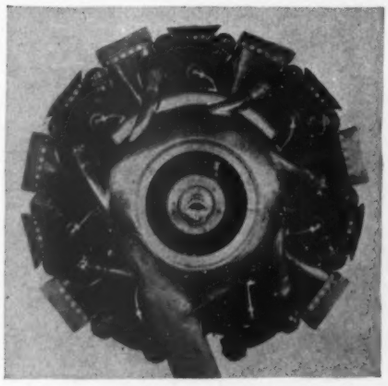


Warner Super Scarab

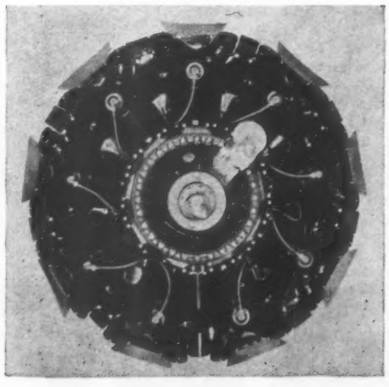
ENGINES for 1939

Continued from page 54

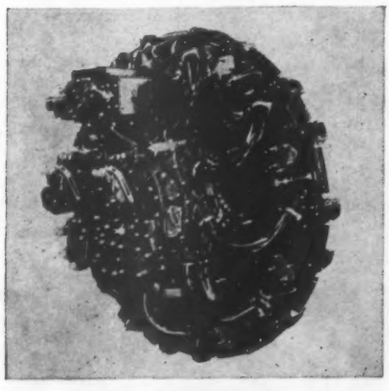
tative of the complete line. Among the notable omissions are several large power plants of both the air and liquid cooled types now under development, but shrouded in military secrecy.



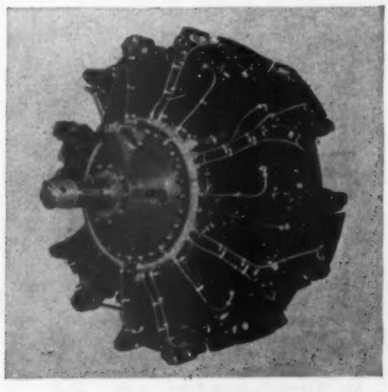
Wright Whirlwind R-760 E Series



Wright Whirlwind R-975 E Series



Wright G-100 Series Cyclone



Wright Double Row Cyclone

WALTER A.

TRANSCONTINENTAL & WESTERN AIR, Inc.

TWA — 10 RICHARDS ROAD — Kansas City, Mo.

Aviation Division,
The Texas Company,
135 East 42nd Street,
New York, N. Y.

Dear Mr. Kief:

The longer I am in maintenance work, the more I am impressed by the character of the lubrication that makes today's aviation engine possible.

In this work, we would immediately know of the slightest increase in depreciation or wear. As you know, the TWA Maintenance System of research, engineering, overhaul, inspection, rebuilding is for this very purpose.

Our enthusiasm for Texaco aviation products and technical service is shown by the fact that we are in our 8th year as Texaco users.

Kind regards.

Very truly yours,

W A Hamilton

WALTER A. HAMILTON
Superintendent of Maintenance

PASSENGERS ○ AIR MAIL ○ AIR EXPRESS

TEXACO

Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

TEXACO A

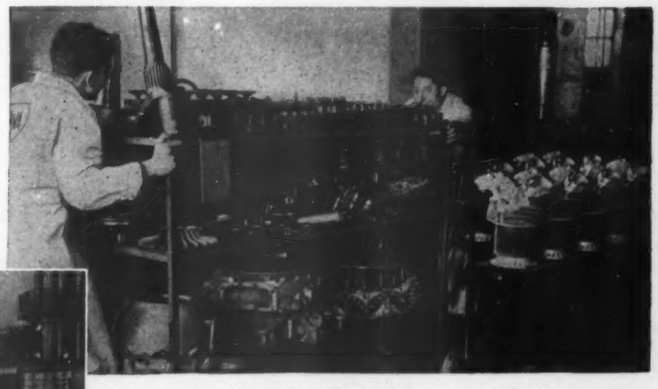
A. HAMILTON

Speaks out!

TRAINED AVIATION ENGINEERS stand ready to show you how to get the best out of Texaco Aviation Products, available at all important airports.

The Texas Company, *Aviation Division,* 135 East 42nd Street, New York City.

MANUAL INSPECTION *of component parts of a disassembled engine. Parts are discarded if there is any evidence of wear.*



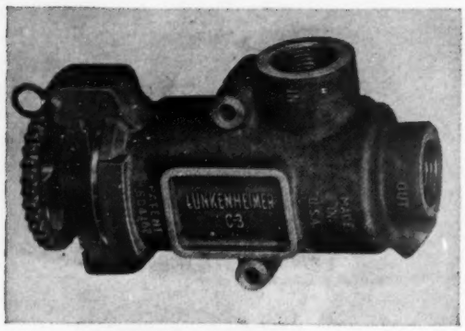
RACKS *containing disassembled engine, ready for re-assembly in TWA's Kansas City overhaul base.*

TWA PLANE *at Kansas City, being serviced with fuel and lubricants by Texaco truck.*

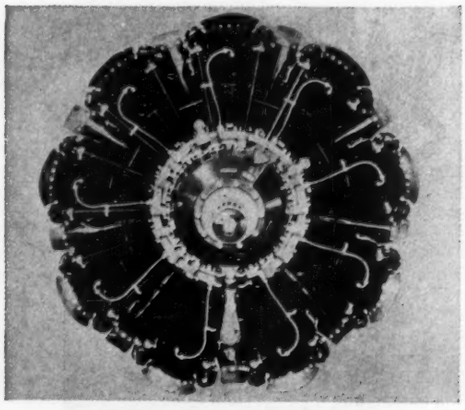
Aviation Products

Aircraft Engine **Accessories**

For classified accessory directory see page 68



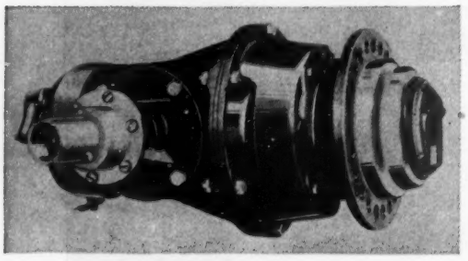
Lunkenheimer Fuel Strainer



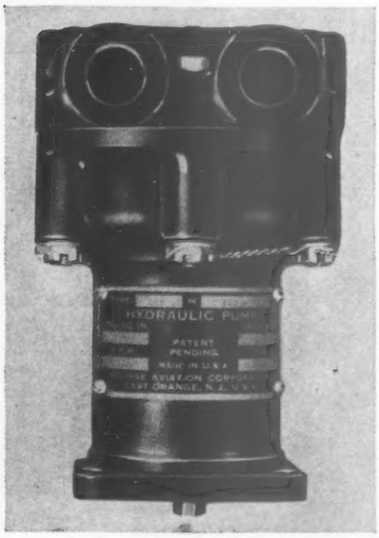
Wright Cyclone with Breeze Shielding

Engine Driven Eclipse Hydraulic Pump with Tongue Drive

R 400 Series Fuel Pump by Pesco

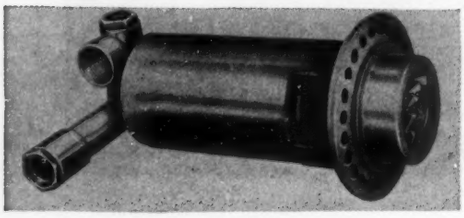


Eclipse Type E-160 Starter



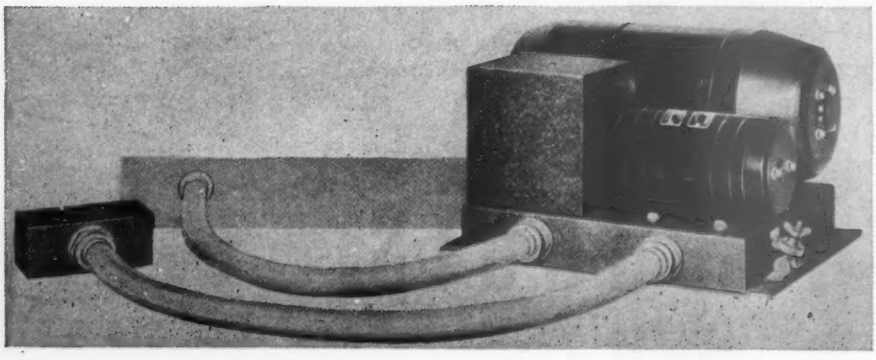
Eclipse Engine Driven Hydraulic Pump with Hex Drive

Bendix-Scintilla Aircraft Magneto Type SF 9L-2

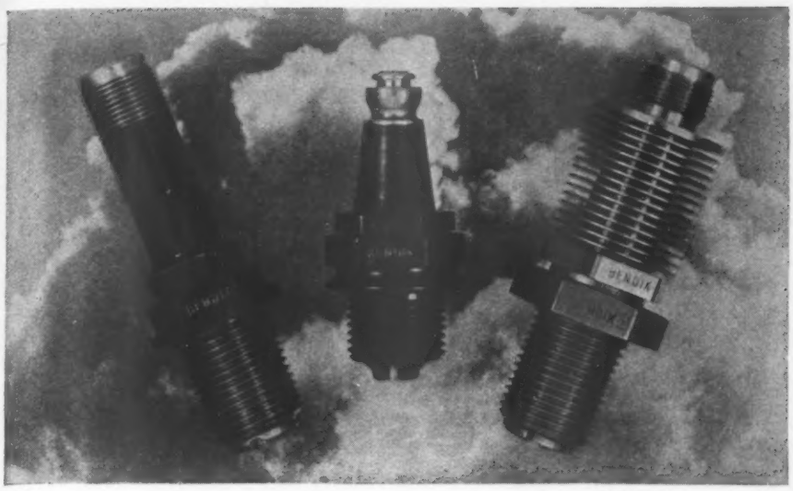


Combustion Starter by Eclipse

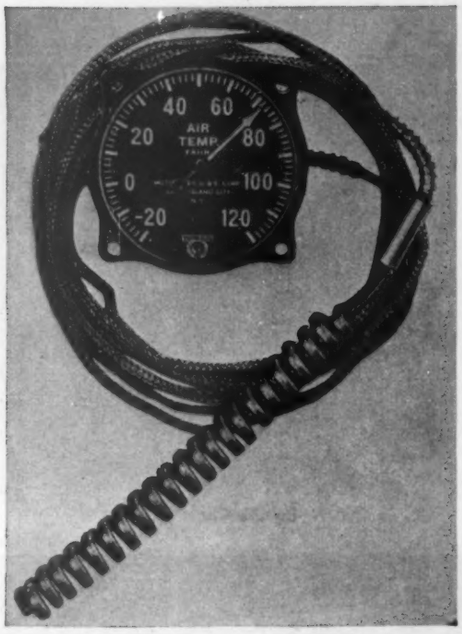
Aero Spark Plug



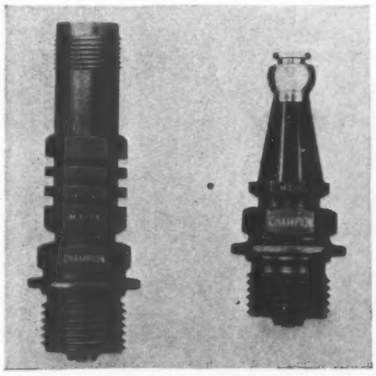
Eclipse Type AD and AA Dynamotors on a Power Pack



Aircraft Spark Plugs by Bendix



Ice Warning Indicator, Model CA by Moto

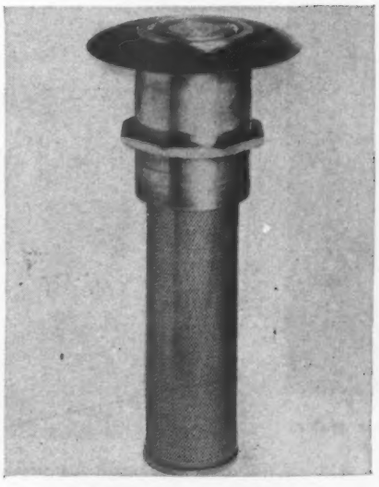


Champion Spark Plugs

Electric Tachometer, Type 378R-01, by Kollsman

Tachometer by Weston

BG Model 298-GS Spark Plug

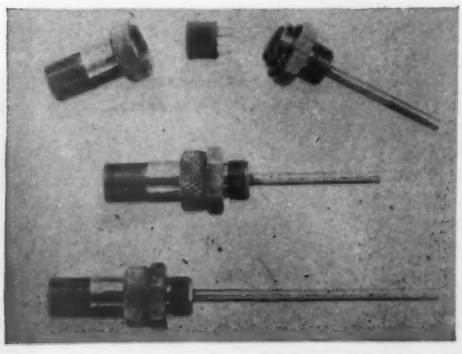


Protectoseal Tank Filler

Romac Vacuum & De-Icer Pump Type B-4

Pioneer Autosyn Tachometer Indicator

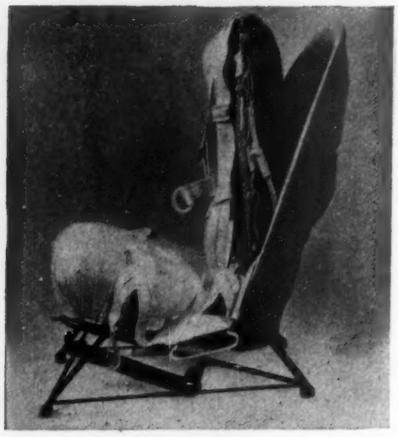
Wittek Hose Clamps



Lewis Engineering Thermocouples

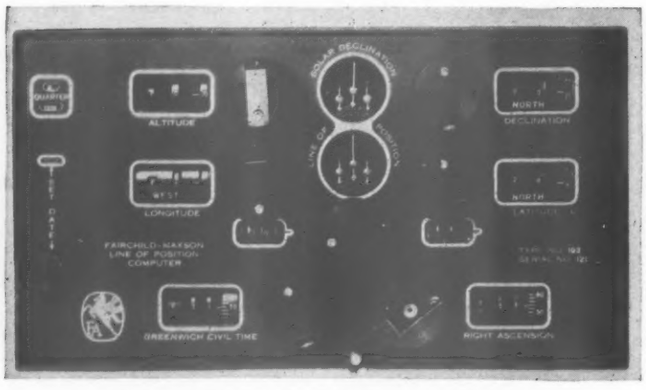
AIRCRAFT
Instruments and Accessories

For classified accessory directory see page 68



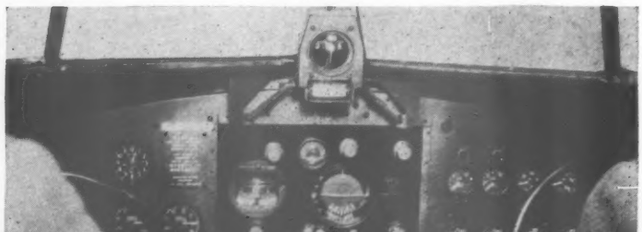
Switlik Chair Chute

Sperry-R.C.A. Automatic Direction Finder



Fairchild Maxson Line of Position Computer

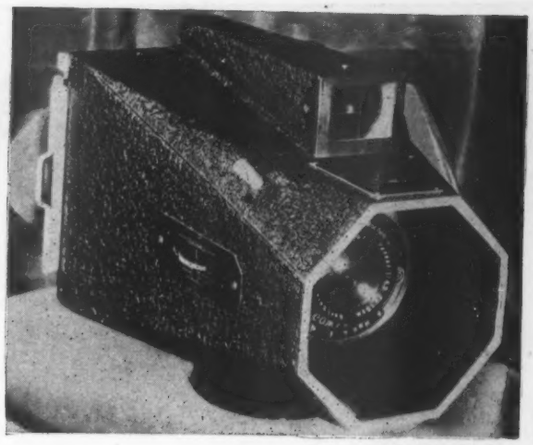
An instrument panel especially grouped for use of the Air Trade system



Transport instrument panel with Sperry Gyropilot (center)

The Stewart-Warner combined instrument for light planes

Using the Fairchild Camera

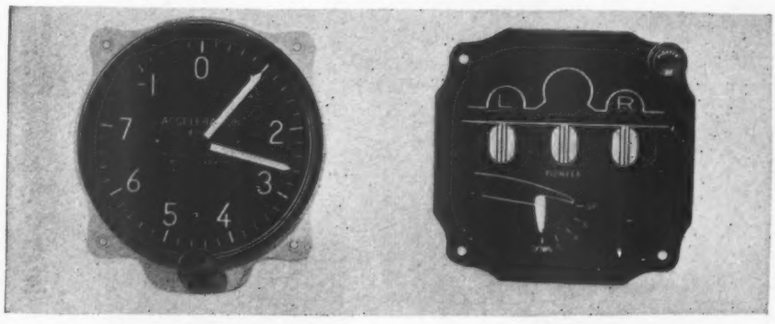


Skyview Model D Aerial Camera

Kollsman Direction Indicator

Pioneer's latest Compass

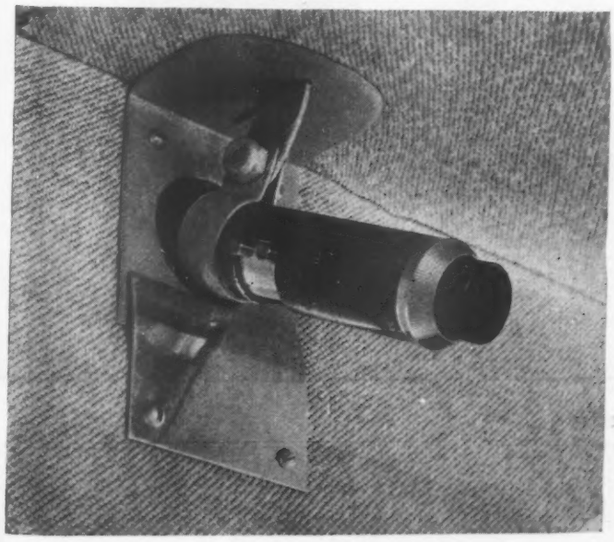
Turn and Bank Indicator by Pioneer



Kollsman Accelerometer, Type 312

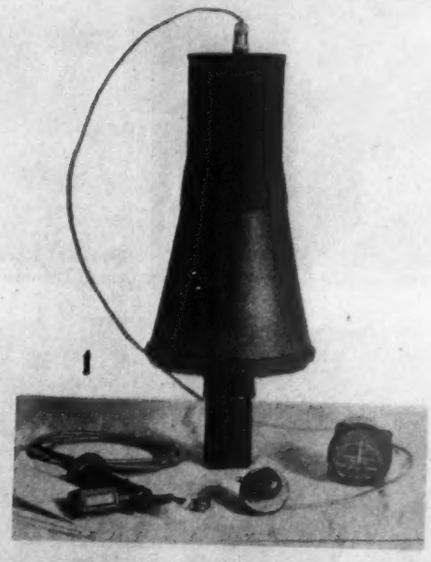
Pioneer Flap Position Indicator

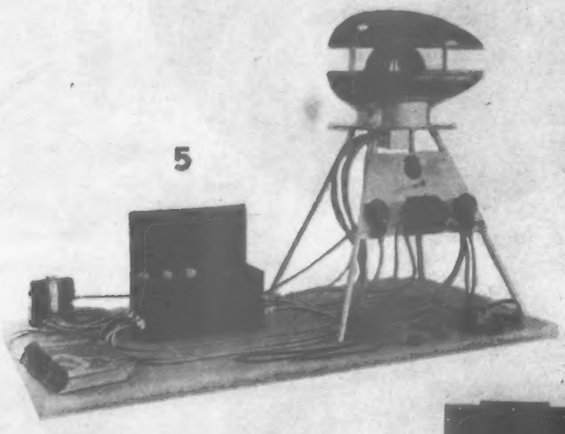
Fairchild Moonglo Instrument Illuminator



Roger Don Rae landing with an Irwin Seat Type 'Chute

RADIO for SAFETY

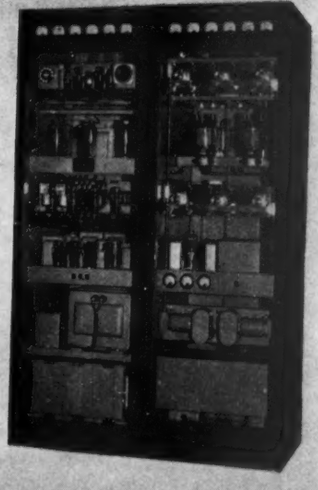

1


5

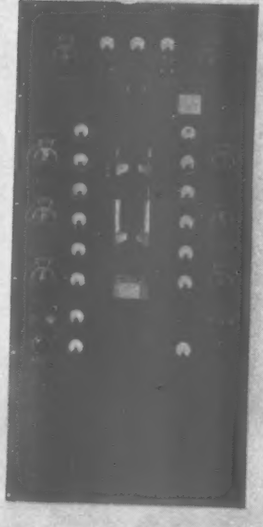
6

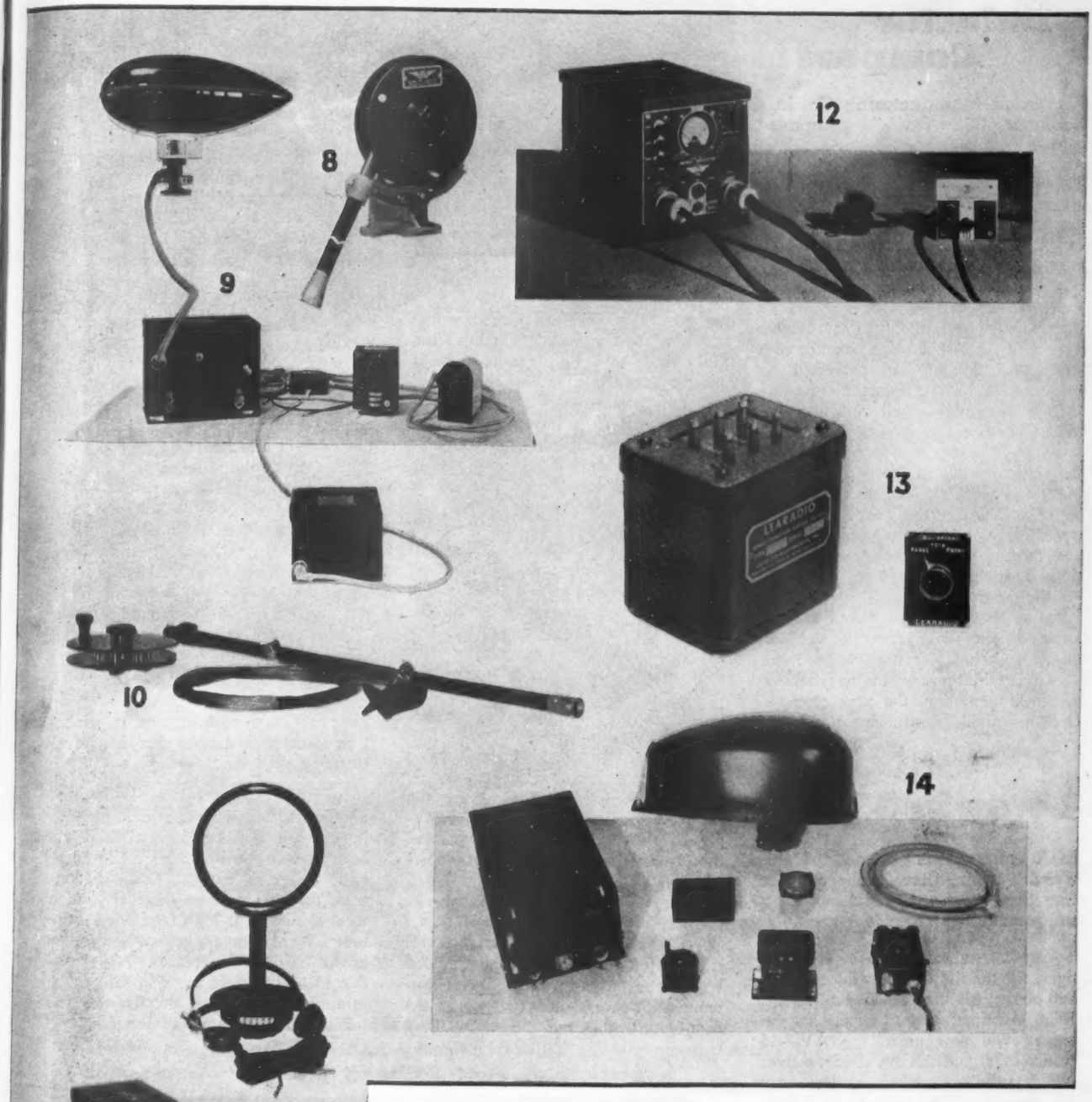
2

7 B A


3

4





1. "Sky-Track," the new earth-inductor compass manufactured by Air-Track

2. Instrument landing transmitter, a recent Bendix Radio Corp development

3. The Collins Radio Company 203C, an aeronautical ground-station transmitter

4. Rotating-loop direction finder, manufactured by I. T. & T.

5. Simon Radioguide, a product of the Radio Navigational Instrument Corp.

6. Western Electric's New 75-Mc marker-beacon Receiver, type 27A

7. Two Radio Receptor Beacon Transmitters: A, for simultaneous beacon-voice, B, ultra-high frequency fan-marker beacon

8. Air Radio's adjustable antenna reel and fairlead

9. Airplane and Marine Direction Finder Corporation's d-f, with cathode-ray indicator

10. Aeronautical Radio Company's reel antenna system

11. Radio Frequency Laboratories' compact beacon-compass receiver, type CB-3

12. A new RCA transmitter for aircraft, the low-powered, light weight AVT-15

13. Lear Developments' Simultaneous Radio Range Filter and Selector Switch

14. Fairchild Aerial Camera Corporation's Visually-Indicating Direction Finder

Inductor Compass

Air Track Manufacturing Co. introduces "Sky-Track" compass

THE EARTH INDUCTOR COMPASS, which determines the direction of the earth's magnetic field by a rotating coil, has not been used in aviation, because the early forms of inductor compass were very sensitive to pitching or bumping movements. Now word comes from Washington that the Air-Track Manufacturing Company (who have developed the Air-Track system of instrument landing) has perfected a new version of the inductor compass with a negligibly small return time. When the compass is swung momentarily by a sudden motion of the ship, the return swing to the correct bearing takes place in less than one-half second. The compass (which is illustrated on page 64) may be mounted in any part of the ship, and its indications brought to a remote indicator on the instrument panel. Also provided on the panel are a course-setting knob, a sensitivity control, and an on-off switch. Because of its freedom from inaccuracy due to pitching and rolling motion, the new compass is also suitable for marine use.

2-way in 25 lb.

RCA announces a new lightweight transmitter and receiver for the itinerant flier, with a unique reel antenna.

TO MEET THE NEEDS of the itinerant flyer, for the light plane where weight and cost are the basic limitations, RCA Manufacturing Company has designed two new units, the AVT-15 transmitter, and the AVR-15 receiver which install, together, at less than 25 pounds. The transmitter (illustrated on page 65) weighs only 18½ pounds, complete with remote control panel and cable. It contains two 6L6 tubes and a vacuum-sealed vibrator power supply, provision for two control crystals, and for switching from one to the other. Tank circuit tuning is accessible from the front panel and is readily locked. Within the cabinet is an antenna loading coil with taps brought out to a switch, for optimum matching to the antenna. The power is low, but when used with the reel antenna described below, it gives 100-mile-

RCA AVR-15 Receiver

radius service. On the ground, working into a wing-to-tail antenna, the radius is 5 to 7 miles, more than is usually needed for on-the-ground communication.

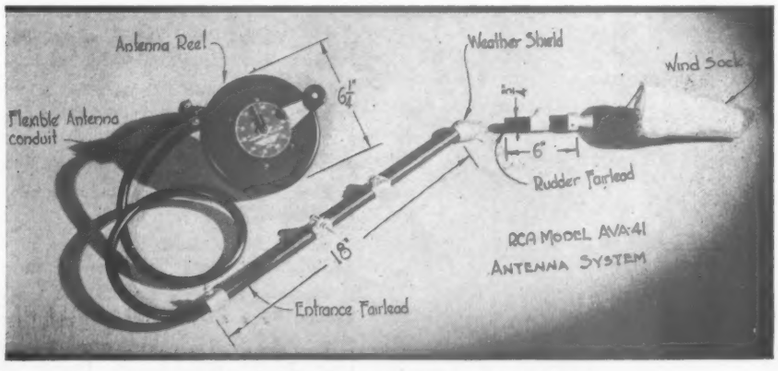
The AVR-15 receiver is a companion to the transmitter, but lighter and so much smaller that it can be mounted anywhere within arms reach of the pilot. The tuning range is the 200 to 400 kc, beacon band. A highly useful gadget is a toggle switch to the right of the tuning dial which switches the tuning from the variable dial to a fixed frequency of 278 kc (traffic control frequency). By flipping this switch, the operator can skip lightly from the beam to the control tower and back again within feeling for the stations. The longest dimension of the receiver is 6¼ inches, and its weight, complete with cable and phones is 5 pounds, 7 ounces. It is perfectly feasible to operate the receiver directly from the power supply of the AVT-15 transmitter, and this is usual procedure if both units are installed. The total installed weight, less antenna, is then only 24 pounds.

To round out the trio of receiver, transmitter and antenna, the Camden boys have brought a hand-reel antenna with several new twists. In the first place, the reel itself is "free wheeling." It can be used only to reel the wire in, not to let it out. The wire is released by turning the reel knob a quarter turn against the reel-in direction, thereby releasing a brake which allows the drag on the windsock to drag the wire out. It is thus completely impossible to un-reel the wire while the plane is on the ground or under any conditions except those giving a good hearty pull on the windsock. In the second place, an innovation in the form of a flexible rubber insulated fairlead is used to convey the antenna wire from the reel to a weather proof fixture. The wire is conducted through the top via a fixed fairlead with a weather-proof bushing. The wire is led straight backward from this bushing to a fixture on the rudder post. At this point, the wire is attached to a fabric wind sock. When the antenna is unreeled, the sock pulls the wire through this fixture and all the advantages of a trailing antenna are available. But when the antenna is reeled in, the wire is still exposed from rudder post to wing, and can be used as a fixed antenna for on-the-ground work.

Short-wave D-f

Breeze Corp announces a direction finder suitable for high-frequency signals

A RADICALLY NEW TYPE of direction finder, which utilizes vertical antennas in place of the conventional loop has been developed by Breeze Corporations Inc. of Newark, N. J. In contrast to the loop-type receiver, which loses accuracy at high frequencies, the new Breeze compass actually improves as the frequency increases. The errors due to night effect are also said to be minimized. Further details will be published as soon as available.



Fixed-or-trailing antenna with flexible fairlead

MARTIN 166

powered by WRIGHT CYCLONES

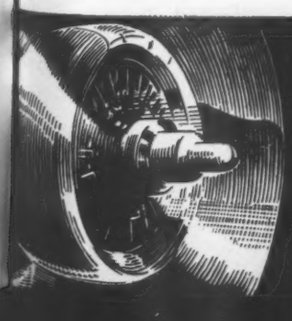
Since 1932, when the Glenn L. Martin Company pioneered the high-speed, mid-wing, twin-engined bomber of the type now identified as the Martin 166, bombers built by Martin have come into use throughout the world as vital units of aerial defense.

The first models of this type, nearly twice as fast as any bomber in service at that time, demonstrated that bombing planes could outspeed the then existing pursuits. Like the first, all but a small percentage have been powered by Wright Cyclone Engines.

Built to a sound and far-sighted basic design, this series of Martin Bombers has proved able to take full advantage of each new advance in aeronautical science.

For example, the Wright Cyclone-powered Martin 166 of 1939 is nearly a mile a minute faster than the first bomber of this outstanding type and, with its greatly increased striking power, is considered one of the world's most effective aerial defense weapons.

WRIGHT AERONAUTICAL CORPORATION
Paterson New Jersey
A Division of Curtiss-Wright Corporation



WRIGHT *Aircraft* ENGINES

ACCESSORY DIRECTORY

Featuring aircraft and engine accessories, materials and parts, airport and shop equipment, and jobbers

AIRCRAFT ACCESSORIES

Aircraft Batteries

Burgess Battery Co., Acoustic Div., 111 W. Monroe St., Chi., Ill.
Electric Storage Battery Co., Allegheny Ave., Phila., Pa.
Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.
National Battery Co., 1728 Roblyn St., St. Paul, Minn.
Prest-O-Lite Battery Co., Inc., Indianapolis, Ind.
Reading Batteries, Inc., Box 893, Reading, Pa.
Willard Storage Battery Co., 246 E. 131st St., Cleve, Ohio

Aircraft Cameras and Supplies

Aero Service Corp., 1612 Chancellor St., Phila., Pa.
Eastman Kodak Co., Roch., N. Y.
Fairchild Aerial Camera Corp., Van Wyck Blvd., Jamaica, L. I., N. Y.
Folmer Graflex Corp., 154 Clarissa St., Roch., N. Y.
Skyview Camera Co., Municipal Airport, Cleve., Ohio

Aircraft Controls

Arens Controls, 1150 W. Marquette Rd., Chi., Ill.
Bloxham Aero Mfg. Co., Chi., Ill.
Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Brewster Aeronautical Corp., Brewster Bldg., L. I. C., N. Y.
Lobdell-Emery Mfg. Co., Alma, Mich., E. Lobdell.
Richland Auto Parts Co. Inc., Mansfield, O.
Shakespeare Products Co., 417 N. Pitcher St., Kalamazoo, Mich.

Aircraft Control Cable

American Steel & Wire Co., 208 S. LaSalle St., Chi., Ill.
Hazard Wire Rope Div. (American Chain & Cable), Wilkes-Barre, Pa.
Roebling's, John A. Sons Co., 640 S. Broad St., Trenton, N. J.

Aircraft Electrical Equipment

Air Radio, 5214 W. 63rd St., Chi., Ill.
Boston Insulated Wire & Cable Co., Dorchester District, Boston, Mass.
Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Cannon Electric Development Co., 420 West Ave. 33, Los Ang., Cal.
Eclipse Aviation Corp., Bendix, N. J.,
Electrical Development Co., 2217 S. Grand Ave., Los Ang., Cal.
Electric Specialty Co., Stamford, Conn.
General Electric Co., 1 River Rd., Schenect., N. Y.
Heintz & Kaufman, Ltd., South San Fran., Cal.
Harvey-Hubbel & Co., Bridgeport, Conn.
Littlefuse Laboratories, 4238 Lincoln Ave., Chi., Ill.
Pioneer Instrument Co. Inc., 754 Lexington Ave., B'klyn., N. Y.
Scintilla Magneto Co. Inc., Sidney, N. Y.
Westinghouse Electric & Mfg. Co., East Pitts., Pa.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.

Aircraft Fire Extinguishers

American LaFrance & Foamite Corp., 100 E. LaFrance St., Elmira, N. Y.
Flash Fire Extinguisher Co., Dayton, O.
Fog Nozzle Co., 1520 E. Slauson Ave., Los Ang., Cal.
Walter Kidde & Co. Inc., 60 West St., Boomfield, N. J.
Phister Mfg. Co., 621-627 E. Pearl St., Cincin., Ohio
Pyrene Mfg. Co., 560 Belmont Ave., Newark, N. J.

Aircraft Floats

Brewster Aeronautical Corp., Brewster Bldg., L. I. C., N. Y.
Edo Aircraft Corp., College Pt., N. Y.

Aircraft Instruments

Aero Instrument Co., 3401 Vega Ave., Cleve., Ohio
Aeromarine Instrument Co. Inc., 450 Whitlock Ave., N. Y. C., N. Y.
Air Radio, 5214 W. 63rd St., Chi., Ill.
American Paulin System, Los Ang., Cal.
Barbour Stockwell Co., 205 Broadway, Cambridge, Mass.
Bausch & Lomb Optical Co., 635 St. Paul St., Roch., N. Y.
Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Cambridge Instrument Co., 3732 Grand Central Terminal, N. Y. C., N. Y.
Chelsea Clock Co., 284 Everett Ave., Chelsea, Mass.
Consolidated Ashcroft Hancock Co. Inc., 11 Elias St., Bridgeport, Conn.
Cramer & Co., R. W., 67 Irving Pl., N. Y. C., N. Y.
Elgin National Watch Co., Elgin, Ill.
Foxboro Co., Foxboro, Mass.
Frieze, Julien P. & Sons, 4 N. Central Ave., Balt., Md.
General Electric Co., Incandescent Lamp Div., Nela Park, Cleve, O.
Hays Corp., Michigan City, Ind.
Jaeger Watch Co., 304 E. 45th St., N. Y. C., N. Y.
Johnson National Insignia Co., 314 W. 14th St., N. Y. C., N. Y.
Kellsman Instrument Co., Inc., 80-08 45th Ave., Elmhurst, N. Y.
Leeds & Northup Co., 4934 Stenton Ave., Phila., Pa.
Lewis Engineering Co., 52 Rubber Ave., Naugatuck, Conn.
Liquidometer Corp., 36-16 Skillman Ave., L. I. C., N. Y.
Moto Meter Gauge & Equipment Div. Electric Auto-Lite Co., La Crosse, Wis.
New Haven Clock Co., 20 W. 47th St., N. Y. C., N. Y.
Pacific Scientific Instrument Co., 1206 Maple Ave., Los Ang., Cal.
Permutit Co., 330 W. 42nd St., N. Y. C., N. Y.
Pioneer Instrument Co. Inc., 754 Lexington Ave., B'klyn., N. Y.
Rieker Instrument Co., 1919 Fairmount Ave., Phila., Pa.
Ritchie, E. S. & Sons, Inc., 112 Cypress St., Brookline, Mass.
Shore Instrument & Mfg. Co., Jamaica, N. Y.
Sperry Gyroscope Co. Inc., Manhattan Bridge Plaza, B'klyn, N. Y.
Star Compass Co., E. Milton, Mass.
Sundt Engineering Co., 4238 Lincoln Ave., Chi., Ill.
Taylor Instrument Companies, Roch., N. Y.
United States Gauge Co., 44 Beaver St., N. Y. C., N. Y.
Waltham Clock Co., 15 Maiden Lane, N. Y. C., N. Y.
West Inst. Co., 52 Broadway, N. Y. C., N. Y.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.
White, Kelvin & Wilfred O. Co., 90 State St., Boston, Mass.

Aircraft Lighting Equipment

Adams & Westlake, Elkhart, Ind.
Air Radio, 5214 W. 63rd St., Chi., Ill.
Corcoran Brown Lamp Co., Cincinn., O.
Dalco, Heartwell Bldg., Long Beach, Cal. Grimes Mfg. Co., Urbana, O.
S. & M. Lamp Co., 118 W. 36th St., Los Ang., Cal.
Lights Inc., 3508 Avalon Blvd. Los Ang., Cal.
Pyle-National Co., 1334 N. Kostner Ave., Chi., Ill.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.

Aircraft Parachutes

Folmer Clogg Co., Lancaster, Pa.
Irving Air Chute Co. Inc., 1670 Jefferson Ave., Buff., N. Y.
Switlik Parachute & Equipment Co., S. Broad & Dye Sts., Trenton, N. J.
Triangle Parachute Co., 1143 Harrison Ave., P. O. Station B. Box 3, Cincinn., Ohio

Aircraft Propellers

American Propeller Co., 401 Bendix Dr., S. Bend, Ind.
Barkley-Grow Aircraft Corp., 13210 French Rd. (Plant), 2017 Penobscot, Detroit, Mich.
California Propeller Co., Ltd., 5075 W. Imperial Highway, Inglewood, Cal.
Curtiss-Wright Corp., Curtiss Aeroplane Div., Kenmore & Vulcan Sts., Buff., N. Y.
Fay-Egan Mfg. Co., Cincinn., O.
Flottorp Propeller Co., Grand Rapids Airport, Gr. Rapids, Mich.
Gardner Propeller Co., Circle Ave., Forest Park, Ill.
Hamilton Standard Propellers, Div. United Aircraft Mfg. Corp., E. Hartford, Conn.
Hartzell Propeller Co., Div. of Hartzell Industries, Inc., Piqua, O.
Lycoming Div. Aviation Mfg. Corp., 1515 Park Ave., Williamsport, Pa.
Marshall-Fahlin Propeller Co., Marshall, Mo.
Maynard-Di Cesare Propeller Corp., Milwaukee County Airport, Cudahy, Wis.
McCauley Aviation Corp., 2901 W. Third St., Dayton, O.
Pittsburgh Screw & Bolt Corp., Pitts., Pa.
Sensenich Brothers, Lititz, Pa.
Stone Propeller Co., Witchita, Kan.
Story, Gawley Co., San Fernando Rd., Glendale, Cal.

Aircraft Radio

Aeronautical Radio Co., Roosevelt Field, L. I., N. Y.
Aerovoice, Inc., Islip, L. I., N. Y.
Air Radio, 5214 W. 63rd St., Chi., Ill.
Airplane & Marine Direction Finder Corp., Lindenhurst, L. I., N. Y.
Aircraft Radio Corp., Boonton, N. J.
Air-Track Manufacturing Corp., McLachlen Building, Wash., D. C.
Aladdin Radio Industries, Inc., 466 W. Superior St., Chi., Ill.
Bendix Radio Corp., 920 E. Fort Ave., Balt., Md. (and) 60 E. 25th St., Chi., Ill.
Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Brush Development Co., 1892 E. 40th St., Cleve., O.
Cannon Electric Development Co., 420 West Ave. 33, Los Ang., Cal.
Communication Development Corp., 156 Liberty St., N. Y. C., N. Y.
Fairchild Aviation, Inc., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y.
Fisher Research Laboratories, 745 Emerson St., Palo Alto, Cal.
General Radio Co., Cambridge, Mass.
Harvey Radio Laboratories, Inc., 25 Thorndike St., Cambridge, Mass.
Heintz & Kaufman Ltd., South San Fran., Cal.
International Tel. & Tel., 67 Broadway, New York, N. Y.
J. V. W. Corp., 534 Broad St., Newark, N. J.
Lear Developments, Inc., 121-5 W. 17th St., N. Y. C., N. Y.
Radiomarine Corp. of America
Radio Frequency Laboratories, Inc., Boonton, N. J.
Radio Navigation Inst. Co., 500 5th Ave., N. Y. C., N. Y.
Radio Receptor Company, 251 West 19th St., N. Y. C.
Ranger Radio Company, 10718 Inglewood Ave., Inglewood, Cal.
RCA Mfg. Aviation Radio Section Co. Inc., Camden, N. J.
Sernon Bache & Co., Greenwich & Morton Sts., N. Y. C., N. Y.
Seabury, Inc., New Brunswick, N. J.
Simplex Electric Co., Route 11, Box 262 A, Indianapolis, Ind.
Trimm Radio Mfg. Co., 1770 W. Bearteau Ave., Chi., Ill.
Washington Institute of Technology, 806 McLachlen Bldg., Wash., D. C.
Westinghouse Electric and Mfg. Co., E. Pitts., Pa.
Western Electric Co. Inc., 195 Broadway, N. Y. C., N. Y.

Aircraft Shock Struts

Automotive Fan & Bearing Co., Wildwood & Fern Ave., Jackson, Mich.
Bendix Products Corp., S. Bend, Ind.
Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleve., O.
Houde Engineering Corp., 537 E. Delavan Ave., Buff., N. Y.
Industrial Engineering & Mfg. Co., 239 John St., Bridgeport, Conn.
Russell Mfg. Co., Middletown, Conn.
Warner Aircraft Corp., 20263 Hoover Ave., Detroit, Mich.

Aircraft Tires

Firestone Tire & Rubber Co., S. Main St., Akron, O.
General Tire & Rubber Co., Englewood Ave., Akron, O.
Goodrich, B. F. Co., Akron, O. & Los Ang., Cal.
Goodyear Tire & Rubber Co., Akron, O.

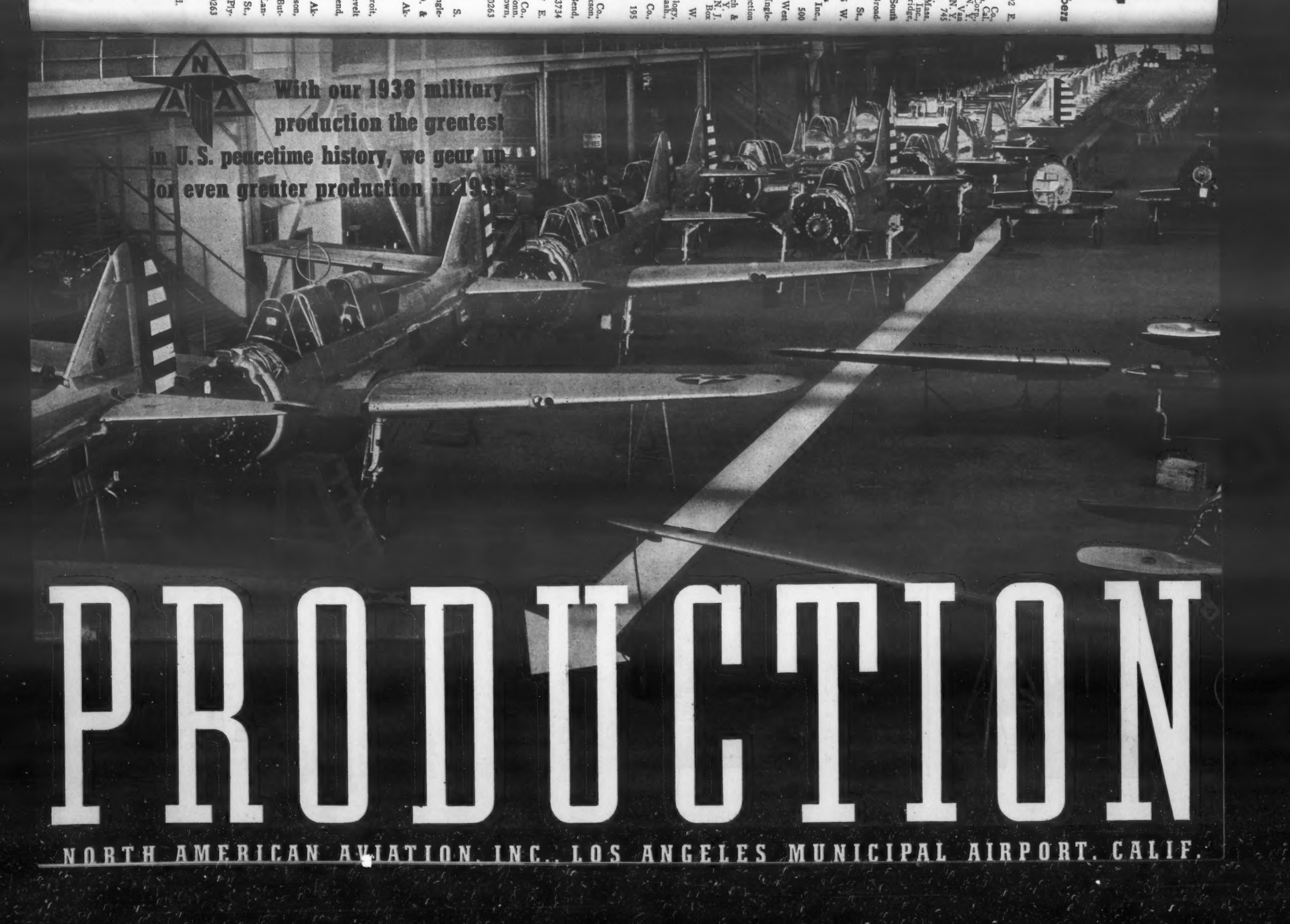
Aircraft Wheels and Brakes

Aircraft Products Corp., Detroit, Mich.
Air Transport Equipment, Roosevelt Field, Garden City, N. Y.
Bendix Products Corp., S. Bend, Ind.
Dayton Wheel Co., Dayton, O.
Goodyear Tire & Rubber Co., Akron, O.
Hayes Industries, Inc., Jackson, Mich.
Shinn Devices Co., Pittsburgh-Butler Airport, Butler, Pa.
Universal Alloy Products Co., Lancaster, N. Y.
Variety Mfg. Co. 2901 W. 3rd St., Dayton, O.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Warner Aircraft Corp., 20263 Hoover Ave., Detroit, Mich.

Aircraft-Miscellaneous

Adams & Westlake, Elkhart, Ind.

(Turn to page 71)


With our 1938 military
production the greatest
in U.S. peacetime history, we gear up
for even greater production in 1939
PRODUCTION
NORTH AMERICAN AVIATION, INC., LOS ANGELES MUNICIPAL AIRPORT, CALIF.

The Birdmen's Perch

Next to the Whopper Club, the most popular feature of the Perch is the Problem Dept. Every month, more and more answers (some right . . . some wrong) come in to be corrected. This month we're getting away from mathematics for a trial hop in plain and simple visualization. Let's hear how you like it.

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips,"
Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

AVIATION QUIZ

Can you identify the five following titles?

1. "The Winged Sword of France"
2. "The Black Eagle"
3. "The Red Knight of Germany"
4. "The Flying Scot"
5. "The Balloon Buster"

(T. W. T. has the correct answers, fellas. Send in yours and he'll red pencil 'em for you.)

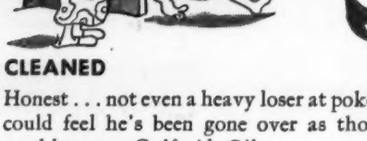
CLEANED

Honest . . . not even a heavy loser at poker could feel he's been gone over as thoroughly as our Gulfpride Oil.

For Gulfpride is refined not only by conventional processes but also by the famous and exclusive Alchlor process that digs out an *extra* 20% of dirt and sludge. That —plus the fact that Gulfpride comes from a 100% pure Pennsylvania base—makes it just about the finest airplane oil money can buy.

A MATTER OF PERSPECTIVE

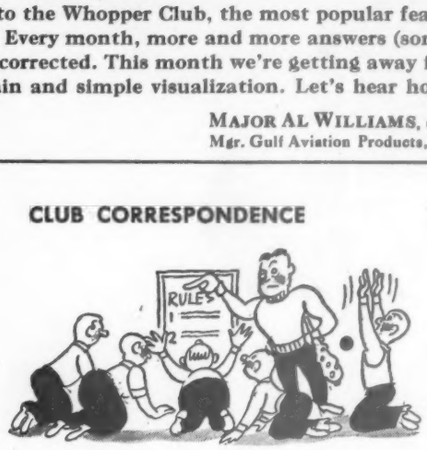
Here's a problem sent us by Ralph B. Oakley of Inglewood, Calif., who says it's a part of a test given by airplane factories to prospective employees. The object is to draw the third or side view of an object when the top and front views are given.



TOP VIEW FRONT VIEW

Mail your sketch to T.W.T. and we'll send back the official rendering of what the darn thing looks like. We warn you . . . you'll be plenty surprised.

CLUB CORRESPONDENCE



We have a note from Fred Scace who is president of the Berkshire Airmen's Club, Inc., in Pittsfield, Mass. The boys up that way evidently have a very successful organization and Fred offers to try to answer any other club officer's special problems if you'll write him direct. Generally speaking he says that there are two main grief-saving rules to observe from the beginning:

1. *Don't try to operate on too close a budget the first year.*
2. *Adhere strictly to C. A. A. regulations.*

We second both motions. And, because we have a lot of faith and interest in the contribution club flying is making to aviation, we hereby throw open the columns of the Perch to any worth-while slants or wrinkles our readers may contribute.

THIS MONTH'S WHOPPER

Dear Major:

Bright and early one morning I took my flying flea out for an altitude test. Thought I'd try 'er out with a little of this Gulf Aviation Gas I hear so much about. Gave 'er about five gallons.

Well, sir, she jumped clean over her chocks and up we shot! 10,000, 15,000 . . . 20,000, 30,000 . . . 50,000! I was taking on altitude at such speed that the sparks from my exhaust caught the tail of my flea on fire!

Right then the altimeter broke at 68,000, a new world's record! But it was so cold that the flame froze stiff as a board! Still I wasn't takin' no chances. I took 'er down and wheeled 'er into the hangar. But the change in altitude musta' made me forget about the fire.

A few seconds later a grease monkey came rushing over screaming like an Indian. "Hey, look at your flea, Captain!"

Sure enough. The flame has thawed out and there's my poor flying flea gyrating all over creation beating its tail on the ground to put out the fire!

Capt. E. Norman Dambacher

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF GULF AVIATION PRODUCTS

(*Cont'd from page 68*)

Aerial Machine & Tool Corp., 260 West St., N. Y. C., N. Y.
Aero Pattern Works (patterns), 277 Military Rd., Buff., N. Y.
Air Cruisers, Inc., 330 Highland Ave., Clifton, N. J.
Aircraft Development Co., 1530 Olive St. N.E., Washington, D. C.
Air Transport Equipment, Roosevelt Field, Garden City, N. Y.
Campbell, Rodney B. & Co., 1632-34 East Nodeau St., Los Ang., Cal.
Chicago Metal Hose Corp., 1315 S. 3rd Ave., Maywood, Ill.
Farrel-Birmingham, Inc., Ansonia, Conn.
Engel Aircraft Specialties, Escondido, Cal.
Federal Aircraft Works, Minneapolis, Minn.
Goodrich, B. F. Co., Akron, O. & Los Ang., Cal.
Heywood-Wakefield Co., Gardner, Mass.
Hill Aircraft Streamliners Co., 700 W. 6th St., Cincinn., O.
International Flare-Signal Div. Kilgore Mfg. Co., Tippecanoe City, O.
Northill Co., Inc., 5221 San Fernando Rd., W., Los Ang., Cal.
Paramount Airc. Prod., Inc., N.Y.C., N.Y.
Pump Engineering Service Corp., 12910 Taft Ave., Cleve., O.
Russell Mfg. Co., Middletown, Conn.
Thos. L. Siebenthaler Mfg. Co., Kans. City, Mo.
Shinn Devices Co., Butler, Pa.
United Aircraft Products, Inc., Dayton, O.
Universal Alloy Products Co. (trail skid shoes), Lancaster, N. Y.

Aircraft Air Compressors

American Engineering Co., Aramingo & Cumberland Sts., Phila., Pa.
Brunner Mfg. Co., 1821 Broad St., Utica, N. Y.
Chicago Pneumatic Tool Co., 6 E. 44th St., N. Y. C., N. Y.
Devilbiss Co., Toledo, O.
Gould Pumps, Inc., 16 Murray St., N. Y. C., N. Y.
Ingersoll-Rand Co., 11 Broadway, N. Y. C., N. Y.
Sullivan Machinery Co., Chi., Ill.
United States Air Compressor Co., 5300 Harvard Ave., Cleve., O.

AIRPORT ACCESSORIES

Airport Buildings

Austin Co., 16112 Euclid Ave., Cleve., O.
Blaw-Knox Co., 2052 Farmers Bank Bldg., Pitts., Pa.
Columbian Steel Tank Co., 1509 W. 12th St., Kans. City, Mo.
Cornell Iron Works, Inc., 36th Ave. & 13th St., L. I. C., N. Y.
International Derrick Equipment Co., 875 Michigan Ave., Columbus, O.
International Stacey Corp., Michigan & Buttles Aves., Columbus, O.
Maryland Metal Building Co., Race & McComas Sts., Balt., Md.
Robertson, H. H., Co., 2000 Grant Bldg., Pitts., Pa.
Trucson Steel Co., Youngstown, O.

Airport Fences

American Steel & Wire Co., 208 S. LaSalle St., Chi., Ill.
Anchor Post Fence Co., Balt., Md.
Cyclone Fence Co., Waukegan, Ill.
Page Fence Assn., 929 Connecticut Ave., Bridgeport, Conn.
Stewart Iron Works, Covington, Ky.

Airport Fire Extinguishers

American LaFrance & Foamite Corp., 100 E. LaFrance St., Elmira, N. Y.
Badger Fire Extinguisher Co., 31 St. James Ave., Boston, Mass.
C-O-Two Fire Equipment Co., Pyrene Bldg., Newark, N. J.
Flash Fire Extinguisher Co., Dayton, O.
Fog Nozzle Co., 1520 E. Slauson Ave., Los Ang., Cal.
Fyr-Fyter Co., 221 Crane St., Dayton, O.
Garrison Engineering Co., Waterbury, Conn.
General Fire Truck Co., Forest Park Blvd., St. Louis, Mo.
Ingas Co., 1201 Hudson St., Hoboken, N. J.
Walter Kidde & Co., Inc., 60 West St., Bloomfield, N. J.
Phister Mfg. Co., 621-627 E. Pearl St., Cincinn., O.
Pyrene Mfg. Co., 560 Belmont Ave., Newark, N. J.
Snyder, M. L. & Son, Jasper & York Sts., Phila., Pa.
Stemsel Fire Extinguisher Mfg. Co., 20th & Ferry Sts., St. Louis, Mo.
Washington Aircraft & Transport Corp., Boeing Field, Seattle, Wash.

Airport First Aid Equipment

Bauer & Black, 2500 S. Dearborn St., Chi., Ill.
Bullard, E. D. Co., San Fran., Cal.
Burroughs Wellcome Co., Inc., 9-11 East 41st St., N. Y. C., N. Y.
Davis Emergency Equipment Co., 55 Van Dam St., N. Y. C., N. Y.
Johnson & Johnson, New Brunswick, N. J.
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pitts., Pa.
Seabury & Johnson, 222 4th Ave., N. Y. C., N. Y.
Snyder, M. L. & Son, Jasper & York Sts., Phila., Pa.

Airport Fuel Systems

Aqua Systems, Inc., 2443 3d Ave., N. Y. C., N. Y.
Bowser, S. F. & Co., Inc., Fort Wayne, Ind.
Columbian Steel Tank Co., 1509 W. 12th St., Kans. City, Mo.
Gilbert-Barker Co., Springfield, Mass.
Goodrich, B. F., Co., Akron, O.
Liquidometer Corp., 36-16 Skillman Ave., L. I. C., N. Y.
Motor Improvements, Inc., 365 Frelinghysen Ave., Newark, N. J.
Protectoseal Co., 1920 S. Western Ave., Chic., Ill.
Pump Engineering Service Corp., 12910 Taft Ave., Cleve., O.
Manhattan Rubber Mfg., Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
Steel Products Engineering Co., Corner Dakota Ave. & Columbia St., Springfield, O.
Swift Lubricator Co., Elmira, N. Y.
United States Fire Protection Co., 1201 Hudson St., Hoboken, N. J.
Yale & Towne Mfg. Co., Stamford, Conn.

Airport Heaters

Airtherm Mfg. Co., 1474 S. Vandeventer Ave., St. Louis, Mo.
American Blower Corp., 6000 Russell St., Detroit, Mich.
American Heating & Ventilating Co., 1505 Race St., Phila., Pa.
American Radiator Co., 40 W. 40th St., N. Y. C., N. Y.
Buffalo Forge Co., Buff., N. Y.
Clarage Fan Co., 500 5th Ave., N. Y. C., N. Y.
Grinnel Co., Inc., 260 W. Exchange St., Prov., R. I.
Ilg Electric Ventilating Co., 15 Park Row, N. Y. C., N. Y.
Modine Mfg. Co., 101 Park Ave., N. Y. C., N. Y.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
United States Fire Protection Co., 1201 Hudson St., Hoboken, N. J.
Trane Co., Second & Cameron Sts., La Crosse, Wis.
U. S. Radiator Corp., 370 Lexington Ave., N. Y. C., N. Y.
Utica Radiator Corp., 47-46 30th St., L. I. C., N. Y.
York Heating & Ventilating Corp., Phila., Pa.

Airport Lights and Accessories

Air Associates, Inc., Garden City, N. Y., Chi., Ill., Glendale, Cal.
Air Radio, 5214 W. 63rd St., Chi.,
American Airport Equipment Co., 5958 Washington Bl., Chi., Ill.
American Cable Co., 230 Park Ave., N. Y. C., N. Y.
American Gas Accumulator, Box 38, Elizabeth, N. J.
Anaconda Wire & Cable Co., 25 Broadway, N. Y. C., N. Y.
Air-Ways Equipment Corp., Mil., Wis.
Bartow Beacons, Inc., 1424 Walnut St., Phila., Pa.
B-B-T Corp. of America, 1029 Newark Ave., Newark, N. J.
Boston Insulated Wire & Cable Co., Dorchester District, Boston, Mass.
Bull Dog Elec. Products Co., Jos. Campan Ave., Detroit, Mich.
Crouse-Hinds Co., Syracuse, N. Y.
Cutler-Hammer, Inc., 315 N. 12th St., Mil., Wis.
General Cable Corp., 420 Lexington Ave., N. Y. C., N. Y.
Hazard Insulated Wire Works, 70-72 Hazle St., Wilkes-Barre, Pa.
Hunter Mfg. Corp., Bristol, Pa.
Kellogg Switchboard & Supply, 1066 W. Adams St., Chicago, Ill.
Kerite Insulated Wire & Cable Co., 30 Church St., N. Y. C., N. Y.
Lakewood Engineering Co., Columbus, O.
Lights, Inc., 1308 Avalon Blvd., Los Ang., Cal.
National Carbide Sales Corp., Lincoln Bldg., N. Y. C., N. Y.
Neon, Claude, Lights, Inc., 41 E. 42nd St., N. Y. C., N. Y.
Pyle-National Co., 1334 N. Kostner Ave., Chi., Ill.
John A. Roebling's Sons Co., 640 S. Broad St., Trenton, N. J.
Rose Aviation Corp., 45 W. 45th St., N. Y. C., N. Y.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.

Airport Sprinkler Systems

Grinnel Co., Inc., 260 W. Exchange St., Prov., R. I.
Viking Flying Boat Co., New Haven, Conn.

Airport Radio

Air Radio, 5214 W. 63rd St., Chi., Ill.
Bendix Radio Corp., 920 E. Fort Ave., Baltimore, Md., 60 E. 25th St., Chi., Ill.
Collins Radio Co., Cedar Rapids, Ia.
Harvey Radio Laboratories, Inc., 25 Thorndike St., Cambridge, Mass.
Lear Developments, Inc., 121-5 W. 17th St., N. Y. C., N. Y.
Radio Frequency Laboratories, Inc., Boonton, N. J.
RCA Mfg. Aviation Radio Section Co., Inc., Camden, N. J.
Universal Microphone Co., Ltd., Ingiewood, Cal.
Washington Institute of Technology, 806 McLachlen Bldg., Washington, D. C.
Western Electric Co., Inc., 195 Broadway, N. Y. C., N. Y.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.

Airport Tractors

Baker Rauling Co., 2168 W. 25th St., Cleve., O.
Caterpillar Tractor Co., Peoria, Ill.
Clark Trutractor, Div. of Clark Equipment Co., Battle Creek, Mich.
Cleveland Tractor Co., 19300 Euclid Ave., Cleve., O.
International Harvester Co., Inc., 180 N. Michigan Ave., Chi., Ill.
Klauer Mfg. Co., Dubuque, Ia.

Airport-Miscellaneous

Air Associates, Inc., Garden City, N. Y., Chi., Ill., Glendale, Cal.
Air Radio, 5214 W. 63rd St., Chi.
Air Reduction Sales Co., 60 E. 42nd St., N. Y. C., N. Y.
Air Transport Equipment, Inc., Roosevelt Field, Garden City, N. Y.
Allith-Prouty, Inc., Danville, Ill.
American Airport Equipment Co., 5958 Washington Bl., Chi., Ill.
Barrett Co., 40 Rector St., N. Y. C.
John Bean Mfg. Co., 217 W. Julian St., San Jose, Cal.
Binks Mfg. Co., Chi., Ill.
Black & Decker Mfg. Co., Towson, Md.
E. D. Bullard Co., San Fran., Cal.
Burton-Rogers, Boston, Mass.
Devilbiss Co., Toledo, O.
Engineering & Research Corp., Wash., D. C.
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich.
Frieze, Julian P., & Sons, 4 N. Central Ave., Balt., Md.
General Electric Co., 1 River Rd., Schenectady, N. Y.
Heald Machine Co., 149 Broadway, N. Y. C., N. Y.
Hobart Brothers Co., Troy, O.
Homestead Valve Mfg. Co., P. O. Box H, Corapolis, Pa.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chi., Ill.
Linde Air Products Co., 30 E. 42d St., N. Y. C., N. Y.
Marianno Seaplane Ramp Co., (Mechanical Lift Ramp) Port Newark, N. J.
Meredith Instrument Co 3207 W. Gage Blvd., Los Ang., Cal.
Milburn Alexander Co., 1418 W. Baltimore St., Balt., Md.
Paasche Air Brush Co., Chi., Ill.
Pennsylvania Aircraft Syndicate, Ltd., Wilford Bldg., Phila, Pa.
Protectoseal Co., 1920 S. Western Ave., Chi., Ill.
A. Schrader's Son, Inc., Div. Scovill Mfg. Co., Inc.
Skilsaw, Inc., 3310-20 Elston Ave., Chi., Ill.
Skinner Purifiers, Inc., 2231 Dalzelle St., Detroit, Mich.
Smith Welding Equipment Corp., Minneapolis, Minn.
South Bend Lathe Works, 425 E. Madison St., S. Bend, Ind.
Stanley Works, New Britain, Conn.
Taylor Instrument Companies, Roch., N. Y.
Union Carbide Co., 205 E. 42nd St., N. Y. C., N. Y.
Weston Electric Instrument Corp., 614 Frelinghuysen Ave., Newark, N. J.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.
White, S. S., Dental Mfg. Co., 10 E. 40th St., N. Y. C., N. Y.
Yale & Towne Mfg. Co., Stamford, Conn.

ENGINE ACCESSORIES

Engine Carburetors

Bendix Aviation Corp., S. Bend, Ind.
Chandler-Groves Co., Detroit, Mich.
Holley Carburetor Co., Vancouver Ave., Detroit, Mich.
Marvel-Schebler Carburetor Div. Borg Warner Corp., Flint, Mich.
Zenith Radio Corp., Chi., Ill.

Engine Exhaust Manifolds

American Tube Bending Co., Inc., Lawrence St., New Haven, Conn.
Brewster Aeronautical Corp., Brewster Bldg., L. I. C., N. Y.
Buhl Stamping Co., 2730 Scotten Ave., Detroit, Mich.
Engel Aircraft Specialties, Escondido, Cal.
Hill Aircraft Streamliners Co., 700 W. Sixth St., Cin., O.
Solar Aircraft Co., Lindbergh Field, San Diego, Cal.

Engine Fuel Systems

Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Evans Appliance Co., Fullerton at Greenfield Rd., Detroit, Mich.
Fink-Dumont-White, Inc., 270 Lafayette St., N. Y. C., N. Y.
Motor Improvements Inc., 365 Frelinghuysen Ave., Newark, N. J.
Protectoseal Co., 1920 S. Western Ave., Chi., Ill.
Pump Engineering Service Corp., 12910 Taft Ave., Cleve., O.

(*Turn to page 75*)

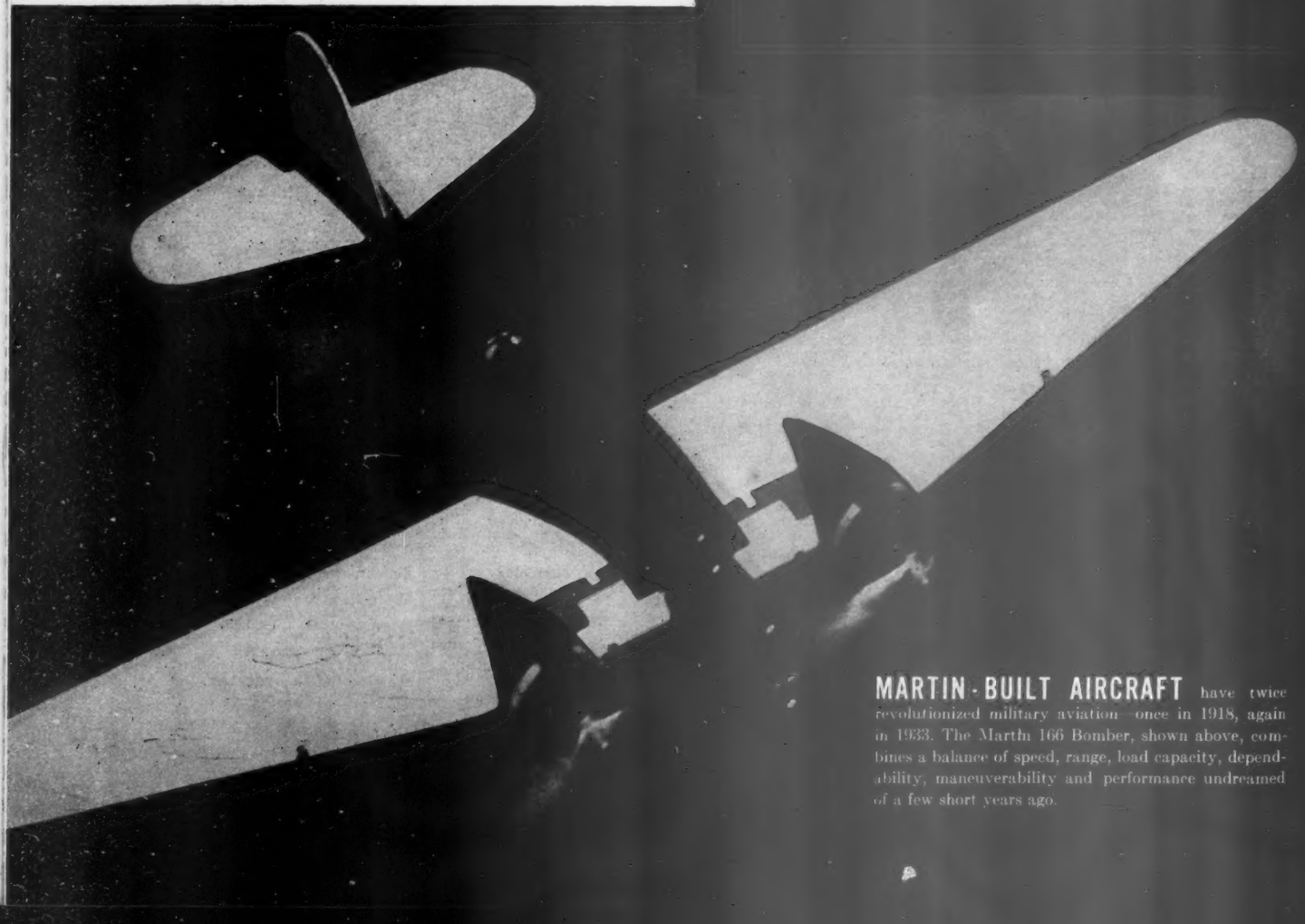
FACTORY:

An abandoned Church in Santa Ana, California, was the first Martin factory. Here, in 1907, Glenn L. Martin started building his first airplane.

MASS PRODUCTION: What a long step from the first handmade Martin to great assembly lines like this! Here, American manufacturing genius achieves the precision, economy and dependability of modern mass production.

SCIENCE of Aerodynamics, in its infancy in 1907, is today so far advanced that each of the 375 technicians on the Martin Engineering Staff concentrates on a single specialized phase of research, testing or design.

Here's how MARTIN AIRCRAFT are built



MARTIN-BUILT AIRCRAFT have twice revolutionized military aviation—once in 1918, again in 1933. The Martin 166 Bomber, shown above, combines a balance of speed, range, load capacity, dependability, maneuverability and performance undreamed of a few short years ago.

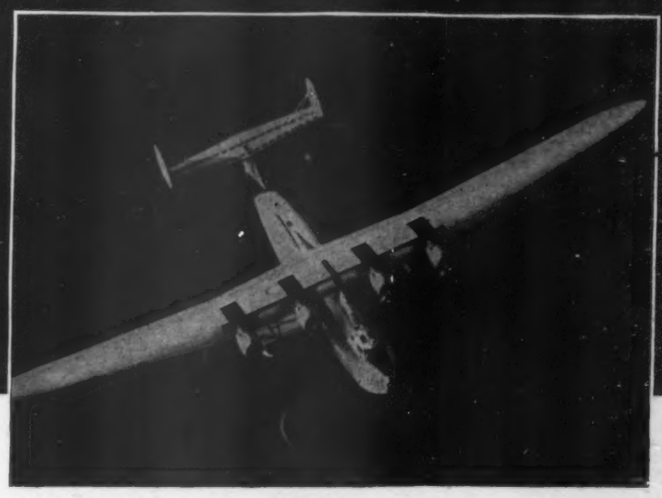
CONTRA
the tiny Sa
indoor ass
spectators
airplane fa

INSPE
fittings n
utilizing
invisible
determine
Martin ai

CONTRAST THE SIZE of the present Martin Plant at Baltimore, with the tiny Santa Ana Church! Modern in every respect, it houses the world's largest indoor assembly floor, so large it could accommodate 3 football fields and 20,000 spectators! Internationally informed experts rate it world's finest, most complete airplane factory.

INSPECTION: Highly-stressed fittings must pass "Magnaflux" test utilizing magnetism to detect cracks invisible to the eye. Such tests predetermine the dependability of every Martin airplane.

PRECISION in Martin manufacturing requires deft touch of specialized craftsmen. Here you see machining of an intricate mechanism that speeds the operation of a Martin retractible landing gear.



WINGS OVER THE WORLD! With a wing span of 157 feet, a flying range more than equal to non-stop trans-Atlantic flight with passengers and pay load, this magnificent Martin Ocean Transport eclipses its famous forbears, the China Clippers, in size, range, capacity, speed and luxury. The same audacious planning which produced this great ship will continue to develop even greater achievements in years to come.

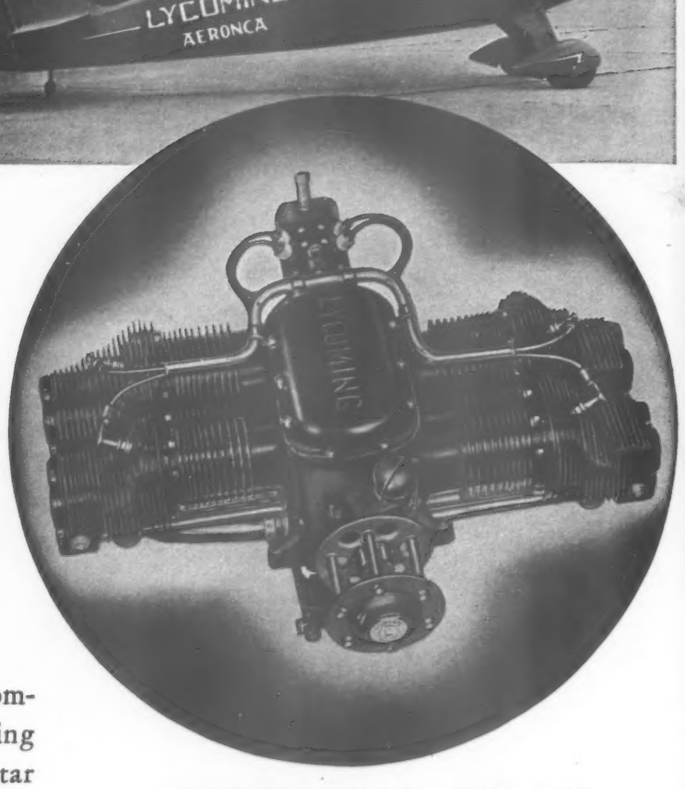
MARTIN

Builders of Dependable *Aircraft Since 1909*

AIRCRAFT

THE GLENN L. MARTIN COMPANY, BALTIMORE, MARYLAND, U. S. A.

A Plane Is Only as Good as Its Engine



LYCOMING 50 HP

4 Cylinder Light-plane Engine 0-145

The Engine Illustrated is with Single Ignition
Also Available with Dual Ignition (55 HP)

. . . and there's no finer engine than a Lycoming! Light-plane enthusiasts in ever increasing numbers are specifying this 50 horsepower star of the skyways for their new Aeroncas, Cubs and Taylorcrafts. And no wonder! Everyone who flies one of these Lycoming-powered ships marvels at its smooth, brilliant performance, amazing economy and absolute reliability.

In the Lycoming 0-145 you get what no other light-plane engine can give—precision and performance born of years of experience in the manufacture of engines for military use under rigid government inspection. Ask your Aeronca, Cub or Taylorcraft Dealer to give you a demonstration in a plane powered by Lycoming. You'll *feel* the difference!

FREE FOLDER! This illustrated folder gives you complete details and specifications of the popular Lycoming 50 HP aircraft engine 0-145. Ask your Aeronca, Cub or Taylorcraft Dealer for your free copy or write us. Address Dept. D29.

AVIATION MANUFACTURING CORPORATION—LYCOMING DIVISION—WILLIAMSPORT, PENNA.

LYCOMING

RELIABLE ENGINES FOR MILITARY TRAINERS, PRIVATE AND COMMERCIAL AIRPLANES

(Cont'd from page 71)

Romec Pump Co., 333 E. Bridge St., Elyria, O.
Steel Products Engineering Co., Dakota Ave. & Columbia St., Springfield, O.
United Aircraft Prod., Inc., Dayton

Engine Ignition

Berling Magneto Co., Buff., N. Y.
Scintilla Magneto Co., Inc., Sidney, N. Y.
United American Bosch Corp., Springfield, Mass.

Engine Pistons and Rings

American Hammered Piston Ring Co., Balt., Md.
Duro Co., 224 Natoma St., San Fran., Cal.
Ohio Piston Co., 5337 St. Clair Ave., Cleve., O.
Perfect Circle Co., Hagerstown, Ind.
Sealed Power Corp., Muskegon, Mich.
Simplex Products Corp., 3830 Kelley Ave., Cleve., O.
United States Hammered Piston Ring Co., Stirling, N. J.
Wilkening Mfg. Co., 2000 S. 71st St., Phila., Pa.

Engine—Radiators

G & O Mfg. Co., 138 Winchester Ave., New Haven, Conn.
Harrison Radiator Div., Gen. Motors Corp., Lockport, N. Y.
McCord Radiator & Mfg. Co., 2587 E. Grand Blvd., Detroit, Mich.
Young Radiator Co., Racine, Wis.

Engine Shielding and Wiring

American Cable Co., 230 Park Ave., N. Y. C., N. Y.
Belden Manufacturing Co., 4687 W. Van Buren St., Chi., Ill.
Boston Insulated Wire & Cable Co., Dorchester District, Boston, Mass.
Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Delco Aviation Corp., Sidney, N. Y.
General Cable Corp., 420 Lexington Ave., N. Y. C., N. Y.
Packard Electric Div. General Motors Corp., Warren, O.
Scintilla Magneto Co., Inc., Sidney, N. Y.
United Aircraft Products, Inc., Dayton, O.
Young Radiator Co., Racine, Wis.

Engine—Spark Plugs

AC Spark Plug Co., General Motors Corp., 930 Harriet St., Flint, Mich.
Aero Spark Plug Co., Inc., 635 Greenwich St., N. Y. C., N. Y.
The B. G. Corp., 136 W. 52d St., N. Y. C., N. Y.
Champion Spark Plug Co., Upton Ave., Toledo, O.
Scintilla Magneto Co., Inc., Sidney, N. Y.

Engine Starters

Aero Supply Mfg. Co., Inc., 61 West Main St., Corry, Pa.
Eclipse Aviation Corp., Bendix, N. J.
Federal Laboratories, Inc., 185 41st St., Pitts., Pa.
Leach Relay Co., 5915 Avalon Blvd., Los Ang., Cal.

Engine Tanks

Aircraft Development Co., 1530 Olive St., N.E., Wash., D. C.
Aluminum Co. of America, Gulf Bldg., Pitts., Pa.
Breeze Corporations, Inc., 24 So. 6th St., Newark, N. J.
Fleetwings, Inc., Bristol, Pa.
Hill Aircraft Streamliners Co., 700 W. 6th St., Cinccinn., O.
Magosy & Buscher, 120 Walker St., N. Y. C., N. Y.
Paramount Welded Aluminum Products Corp., 314 39th St., B'klyn., N. Y.

Engine Valves

Jadson Motor Products Co., 8354 Wilcox Ave., Bell, Cal.
Sealed Power Corp., Muskegon, Mich.
Thompson Products, Inc., 2196 Clarkwood Rd., Cleve., O.
Wilcox-Rich, Div. of Eaton Mfg Co., 9771 French Rd., Detroit, Mich.

Engine Miscellaneous

Air-Maze Corp., 310 Caxton Bldg., Cleve., O.
Air Transport Equipment, Inc., Roosevelt Field, Garden City, N. Y.
Aircraft Development Co., 1530 Olive St., N.E., Wash., D. C.
American Metal Hose Division, American Brass Co., Waterbury, Conn.
Cuno Engineering Corp., 295 S. Vine St., Meriden, Conn.
Eclipse Aviation Corp., Bendix, N. J.
Fitzgerald Mfg. Co., 200 5th Ave., N. Y. C., N. Y.
General Electric Co., 1 River Rd., Schenectady, N. Y.
Ideal Clamp Mfg. Co., Inc., 200 Bradford St., B'klyn., N. Y.
Jadson Motor Products Co., 8354 Wilcox Ave., Bell, Cal.
Laminated Shim Co., Inc., 21-24 44th Ave., L. I. C., N. Y.
Motor Improvements, Inc., 365 Frelinghuysen Ave., Newark, N. J.
Permatex Co., Ave. Y & E. 18th St., B'klyn., N. Y.
Shinn Devices Co., Pittsburgh-Butler Airport, Butler, Pa.
Simmonds Aerocessories, 551-5th Ave., N. Y. C., N. Y.
Staynew Filter Co., Roch., N. Y.
White, S. S., Dental Mfg. Co., 10 E. 40th St., N. Y. C., N. Y.
Wittek Mfg. Co., 4305 W. 24th Pl., Chi., Ill.

MATERIALS

Bearing Metals

American Non-Gran Bronze Corp., Berwyn, Pa.
Bearium Metals Corp., 258 State St., Roch., N. Y.
Bound Brook Oil-Less Bearing Co., Bound Brook, N. J.
Chrysler Corp., Amplex Div., 6501 Harper Ave., Detroit, Mich.
Federal-Mogul Corp., 11031 Shoemaker, Detroit, Mich.
Lumen Bearing Co., 197 Lathrop St., Buff., N. Y.

Cleaning Compounds

Bravo Products Co., Ann Arbor, Mich. and Detroit, Mich.
Curran Corp., 6 Pleasant St., Malden, Mass.
Ford, J. B., Sales Co., Wyandotte, Mich.
Fischer's Surfa-Saver, Inc., 261 11th Ave., N. Y. C., N. Y.
Gem Shine Prod. Co., 7945 S. Elizabeth St., Chi., Ill.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., 22 Thames St., N. Y. C., N. Y.
Turko Products, Inc., Los Ang., Cal.

Fabrics (Decorative)

L. C. Chase & Co., 295 5th Ave., N. Y. C., N. Y.
Collins & Aikman Corp., 200 Madison Ave., N. Y. C., N. Y.
Colvinex Corp., 250 E. 43rd St., N. Y. C., N. Y.
DuPont, E. I., De Nemours & Co., Wilmington, Del.
Eagle-Ottawa Leather Co., Grand Haven, Mich.
Johnson & Faulkner, 45 E. 53rd St., N. Y. C., N. Y.
Kenwood Mills, Albany, N. Y.
Laidlaw Co., 16 W. 60th St., N. Y. C., N. Y.
Massachusetts Mohair Plush Co., 80 Federal St., Boston, Mass.
Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, Ind.
Schumacher, F. & Co., 60 W. 40th St., N. Y. C., N. Y.
Shelton Looms, 1 Park Ave., N. Y. C., N. Y.
United States Rubber Products, Inc., 1790 Broadway, N. Y. C., N. Y.
Wiese, William & Co., 234 W. 56th St., N. Y. C., N. Y.

Fabrics (Wing)

Air Associates, Garden City, N. Y., Chi., Ill., Glendale, Cal.
Suncook Mills, 40 Worth St., N. Y. C., N. Y.
Wellington Sears & Co., 65 Worth St., N. Y. C., N. Y.

Finishing

American Chemical Paint Co., Ambler, Pa.
Berry Bros., 211 Leib St., Detroit, Mich.
Cook Paint & Varnish Co., Kan. City, Mo. and Detroit, Mich.
DuPont, E. I., De Nemours & Co., Wilmington, Del.
Glidden Co., Cleve., O.
Johns-Manville, 22 E. 40th St., N. Y. C., N. Y.
Lowe Brothers, 452 E. 3rd St., Dayton, O.
Merrimac Chemical Co., Everett Station, Boston, Mass.
Murphy Varnish Co., 224 McWhorter St., Newark, N. J.
Perry Austen Mfg. Co., Grasmere, S. I., N. Y.
Phoenix Aircraft Products Co., Williamsville, N. Y.
Pittsburgh Plate Glass Co., Pitts., Pa.
Pratt & Lambert, 73-97 Tonawanda St., Buff., N. Y.
Randolph Finishing Products Co., Carlstadt, N. J.
Sherwin-Williams Co., 101 Prospect Ave., N.W., Cleve., O.
Spray Engineering Co., 114 Central St., Somerville, Mass.
Titanine, Inc., Union, Union Co., N. J. (Box # 455)
United States Radium Corp., 535 Pearl St., N. Y. C., N. Y.
Valentine & Co., 386 4th Ave., N. Y. C., N. Y.
Wailes Dove-Hermiston Corp., 17 Battery Pl., N. Y. C., N. Y.
Zapon Co., 50 E. 42nd St., N. Y. C., N. Y.

Fuels and Oils

Atlantic Refining Co., 50 W. 50th St., N. Y. C., N. Y.
Cities Service Oil Co., 70 Pine St., N. Y. C., N. Y.
Crusader Oil Co., Elizabeth, N. J.
Ethyl Gasoline Corp., Chrysler Bldg., N. Y. C., N. Y.
Gulf Oil Corp., Gulf Refining Co., Pitts., Pa.
Kendall Refining Co., Bradford, Pa.
Fiske Bros. Refining Co., Lubriplate Division, 129 Lockwood St., Newark, N. J.
Pennzoil Co., Oil City, Pa.
Phillips Petroleum Co., Bartlesville, Okla.
Pure Oil Co., 35 E. Wacker Drive, Chi., Ill.
Richfield Oil Corp., 19 W. 50th St., N. Y. C., N. Y.
Shell Oil Co., Shell Bldg., San Fran., Cal.
Shell Petroleum Corp., Shell Bldg., St. Louis, Mo.
Shell Union Oil Corp., Rockefeller Plaza, N. Y. C., N. Y.
Sinclair Refining Co., 630 Fifth Ave., N. Y. C., N. Y.
Socony-Vacuum Oil Co., Aviation Sales Dept., 26 Broadway, N. Y. C., N. Y.
Stanavo Specification Board, 225 Bush St., San Fran., Cal.
Standard Oil Co. of Calif., 225 Bush St., San Fran., Cal.
Standard Oil Co. of N. J., Aviation Div., 26 Broadway, N. Y. C., N. Y.
Standard Oil Co. (Indiana), 26 Broadway, N. Y. C., N. Y.
Texas Co., 135 E. 42nd St., N. Y. C., N. Y.
Tidewater Oil Co., 17 Battery Pl., N. Y. C., N. Y.
Wolverine-Empire Refining Co., 51 Madison Ave., N. Y. C., N. Y.

Glass, etc.

American Window Glass Co., 1601 Farmers Bank Bldg., Pitts., Pa.
du Pont Viscoloid Co., 350 5th Ave., N. Y. C., N. Y.
Libby-Owens-Ford Glass Co., 606 Madison St., Toledo, O.
Pittsburgh Plate Glass Co., Pitts., Pa.
Röhm & Haas Co. Inc., 222 W. Wash. Sq., Phila., Pa.

Insulating

American Felt Co., 315 4th Ave., N. Y. C., N. Y.
American Hair & Felt Co., 1844 Merchandise Mart, Chi., Ill.
Booth Felt Co. Inc., 485 18th St., B'klyn, N. Y.
Burgess Battery Co., 111 W. Monroe St., Chi., Ill.
Dry-Zero Corp., Merchandise Mart, Chi., Ill.
Felters Co., 210 South St., Boston, Mass.
Johns-Manville Corp., 22 E. 40th St., N. Y. C., N .Y.
Molded Insulation Co., 3246 Ludlow St., Phila., Pa.
Seaman Paper Co., 410 N. Michigan Ave., Chi., Ill.

Metals

Allegheny Steel Co., Brackenridge, Pa.
Aluminum Co. of America., Gulf Bldg., Pitts., Pa.
Aluminum Industries, 2416 Beekman St., Cincinn., O.
American Brass Co., Waterbury, Conn.
American Magnesium Corp., Cleve., O.
American Sheet & Tin Plate Co., Frick Bldg., Pitts., Pa.
American Steel & Wire Co., 208 S. LaSalle St., Chi., Ill.
Atlas Steel Casting Co., 1963 Elmwood Ave., Buff., N. Y.
Baush Machine & Tool Co., Springfield, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bunting Brass & Bronze Co., 715-755 Spencer St., Toledo, O.
C. F. Burgess Laboratories, Inc., 202 E. 44th St., N. Y. C., N. Y.
Carpenter Steel Co., Reading, Pa.
Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn.
Cleveland Tungsten Mfg. Co., 10200 Meech Ave., Cleve., O.
Climax Molybdenum Co., 500 5th Ave., N. Y. C., N. Y.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co., Chrysler Bldg., N. Y. C., N. Y.
Dow Chemical Co., Midland, Mich.
Electro-Metallurgical Co., 30 E. 42nd St., N. Y. C., N. Y.
Haynes-Stellite Co., Kokomo, Ind.
International Nickel Co., 67 Wall St., N. Y. C., N. Y.
Republic Steel Corp., Chrysler Bldg., N. Y. C., N. Y.
U. S. Steel Corp., 30 Church St., N. Y. C., N. Y.
Universal Alloy Products Co., Lancaster (Buff.), N. Y.

Rubber, Synthetics, etc.

American Hard Rubber Co., N. Y. C., N. Y.
Bakelite Corp., 247 Park Ave., N. Y. C., N. Y.
Bloxham Aero Mfg. Co., Chi., Ill.
Continental-Diamond Fibre Co., Newark, Del.
Continental Rubber Works, Erie, Pa.
DuPont, E. I. De Nemours & Co., Wil., Del.
Formica Insulation Co., 4614 Spring Grove Ave., Cincinn., O.
Goodrich, B. F., Co., Akron, O., & Los Ang., Cal.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Passaic, N. J.
Spaulding Fibre Co., 484 Broome St., N. Y. C., N. Y.
Thiokol Corp., Yardville, N. J.
United States Rubber Products, 1790 Broadway, N. Y. C., N. Y.
Weatherhead Co., 300 E. 131st St., Cleve., O.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.

Wood and Plywood

Algoma Plywood & Veneer Co., Algoma, Wis.
Auld, D. L., Co., 5th Ave. & 5th St., Columbus, O.
Balsa Wood Corp., 158 Pioneer St., B'klyn, N. Y.
Carrom Co., E. Ludington Ave., Ludington, Mich.
Cross, Austin & Ireland Lumber Co., 1246 Grand St., B'klyn, N. Y.
Haskelite Mfg. Corp., 208 W. Wash. St., Chi., Ill.
Met-L-Wood Corp., 6755 W. 65th St., Chi., Ill.
National Aircraft Materials Corp., Rutland, Vt.
Paxton, Frank, Lumber Co., Kan. City, Kan.
Posey, J. V. G. & Co., Terminal Bldg., 6th St., Port., Ore.
United States Plywood Corp., 616 W. 46th St., N. Y. C., N. Y.

Yoho & Hooker Lumber Co., 523 Williamson Ave., Youngstown, O.

Miscellaneous

Casein Co. of America, Bainbridge, N. Y.
L. W. Ferdinand & Co., Boston, Mass.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Passaic, N. J.

PARTS

Bearings

Allison Engineering Co., Div. General Motors Corp., Speedway, Indianapolis, Ind.
American Non-Gran Bronze Corp., Berwyn, Pa.
Barnes Air Service Co., Indianapolis, Ind.
Bantam Bearings Corp., S. Bend, Ind.
Chrysler Corp., Amplex Div., 6500 Harper Ave., Detroit, Mich.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler St., Jamestown, N. Y.
New Departure, Div. General Motors Corp., Bristol, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S. K. F. Industries, Front St. & Erie Ave., Phila., Pa.
Timken Roller Bearing Co., 1835 Dueber Ave. S. W., Canton, O.

Cables (Structural)

American Steel & Wire Co., 208 S. LaSalle St., Chi., Ill.
American Cable Co., 230 Park Ave., N. Y. C., N. Y.
Hazard Wire Rope, Div. American Chain & Cable Co., Wilkes-Barre, Pa.
Mac Whyte Co., Kenosha, Wis.
Roebling's John A. Sons Co., 640 S. Broad St., Trenton, N. J.

Fabricated

Aerial Machine & Tool Corp., 260 West St., N. Y. C., N. Y.
Barnes Air Service Co., Indianapolis, Ind.
Bendix Products Corp., S. Ben. Ind.
Bohn Aluminum & Brass Corp., 2512 E. Grand Blvd., Detroit, Mich.
Boston Gear Works, 151 Lafayette St., N. Y. C., N. Y.
Breeze Corporations 24 S. 6th St., Newark, N. J.
Brewster Aeronautical Corp., Brewster Bldg., L. I. C., N. Y.
Budd. Edw. G. Mfg. Co., 25th & Hunting Park Ave., Phila., Pa.
Buhl Stamping Co., 2739 Scotten Ave., Detroit, Mich.
Continental - Diamond Fibre Co., Newark, Del.
Cunningham-Hall Aircraft Corp., 13 Canal St., Roch., N. Y.
Curtiss-Wright Corp., Curtiss Aeroplane Div., Kenmore & Vulean St., Buff., N. Y.
Dalco, Heartwell Bldg., Long Beach, Cal.
Dayton Mfg. Co., 2240 E. 3d St., Dayton, O.
Doehler Die Casting Co., 386 4th Ave., N. Y. C. and Toledo, O.
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich.
Formica Insulation Co., 4614 Spring Grove Ave., Cincinn., O.
Fleetwings, Inc., Bristol, Pa.
General Tire & Rubber Co., Englewood Ave., Akron, O.
G & O Mfg. Co., 138 Winchester Ave., New Haven, Conn.
Goodrich, B. F., Co., New Haven, Conn.
Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y.
Hall Aluminum Aircraft Corp., Radcliffe St., Bristol, Pa.
Hill Aircraft Streamliners Co., 700 W. 6th St., Cincinn., O.
Houde Engineering Corp., 537 E. Delavan Ave., Buff., N. Y.
Industrial Engineering & Mfg. Co., 239 John St., Bridgeport, Conn.
Kirkham Eng. & Mfg. Corp., Farmingdale, L. I., N. Y.
Lord Mfg. Co., 36 Security Bldg., Erie, Pa.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Mishawaka Rubber & Woolen Mfg. Co., Mishawaka, Ind.
National Steel Products, Correy, Pa.
Park Drop Forge Co., 730 E. 79th St., Cleve., O.
Raymond Mfg. Co., Corry, Pa.
Solar Aircraft Co., Lindbergh Field, San Diego, Cal.
Teicher Mfg. Corp., 137th St. & 34th Ave., Flushing, L. I., N. Y.
Thompson Products, Inc., 2196 Clarkwood Rd., Cleve., O.
United Aircraft Products, Dayton, O.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., E. Pitts., Pa.
Wrought Washer Mfg. Co., 2143 S. Bay St., Mil., Wis.

Fastening Devices

American Screw Co., 21 Stevens St., Prov., R. I.
Dardelet Threadlock Corp., 120 Broadway, N. Y. C., N. Y.
Dzus Fastener Co., Babylon, L. I., N. Y.
Elastic Stop Nut Corp., 1001 Newark Ave., Elizabeth, N. J.
Hartford Machine Screw Co., 476 Capitol Ave., Hartford, Conn.
Ideal Clamp Mfg. Co., 200 Bradford St., B'klyn, N. Y.
Industrial Engineering & Mfg. Co., 239 John St., Bridgeport, Conn.
Kellogg Switchboard & Supply, 1066 W. Adams St., Chi., Ill.
Milford Rivet & Machine Co., Milford, Conn.
Palnut Co., 58 Cordier St., Irvington, N. J.
Parker-Kalon Corp., 200 Varick St., N. Y. C., N. Y.
Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chi., Ill.
United-Carr Fastener Corp., 31 Ames St., Cambridge, Mass.
Wrought Washer Mfg. Co., 2143 S. Bay St., Mil., Wis.

Fittings and Hardware

Aircraft Hardware Mfg. Co., 1391 Lafayette Ave., N. Y. C., N. Y.
Breeze Corporations, 24 S. 6th St., Newark, N. J.
Imperial Brass Mfg. Co., 524 S. Racine Ave., Chi., Ill.
Landers, Frary & Clark, New Britain, Conn.
Lunkenheimer Co., Cincinn., O.
Parker Appliance Co., 17325 Euclid Ave., Cleve., O.
Stewart Warner Corp., 1826 Diversey Pkwy., Chi., Ill.

Forgings

Atlas Drop Forge Co., 209 W. Mt. Hope Ave., Lansing, Mich.
Billings & Spencer, 1 Laurel St., Hartford, Conn.
Canton Drop Forging & Mfg. Co., Canton, O.
Endicott Forging & Mfg. Co., Endicott, N. Y.
Farrell-Birmingham Co., Ansonia, Conn.
Fitzgerald Mfg. Co., 200 5th Ave., N. Y. C., N. Y.
Govro-Nelson Co., 1931 Antoinette, Detroit, Mich.
Park Drop Forge Co., 730 E. 79th St., Cleve., O.
Union Drawn Steel Co., Chrysler Bldg., N. Y. C., N. Y.
Union Switch & Signal Co., 350 5th Ave., N. Y. C., N. Y.
Williams, J. H. & Co., 273 Spring St., N. Y. C., N. Y.
Wyman-Gordon Co., Worcester, Mass.

Gaskets

Detroit Gasket & Mfg. Co., 12640 Burt Rd., Detroit, Mich.
Fitzgerald Mfg. Co., 200 5th Ave., N. Y. C., N. Y.
Garlock Packing Co., Palmyra, N. Y.
Goetze Gasket & Packing Co., New Brunswick, N. J.
McCord-Radiator & Mfg. Co., 2587 E. Grand Blvd., Detroit, Mich.
Manhattan Rubber Mfg., Div. of Raybestos - Manhattan, Passaic, N. J.
Vellumoid Co., 54 Rockdale St., Worcester, Mass.
Victor Mfg. & Gasket Co., 5750 W. Roosevelt Rd., Chi., Ill.

Seats

Heywood, Wakefield Co., Gardner, Mass.

Shock Washers

Garlock Packing Co., Palmyra, N. Y.
Lord Mfg. Co., 36 Security Bldg., Erie, Pa.

Springs

Raymond Mfg. Co., Corry, Pa.
Wallace Barnes Co., Bristol, Conn.

Tie Rods

Breeze Corporations, 24 S. 6th St., Newark, N. J.
Hartshorn, Stewart Co., 250 Fifth Ave., N. Y. C., N. Y.
MacWhyte Co., Kenosha, Wis.

Tubing (Flexible)

American Brass Co., Waterbury, Conn.
American Metal Hose Div., American Brass Co., Waterbury, Conn.
Breeze Corporations, Inc., 24 S. 6th St., Newark, N. J.
Chicago Tubing & Braiding Co., Maywood, Ill.
Eclipse Aviation Corp., Bendix, N. J.
Pennsylvania Flexible Metallic Tubing Co., 7215 Powers Lane, Phila., Pa.
Titeflex Metal Hose Co., 500 Frelinghuysen Ave., Newark, N. J.
Seamlex Co., 519 48th Ave., L. I. C., N. Y.
United Metal Hose Co., 36-01 43rd Ave., L. I. C., N. Y.

Tubing (Non-Ferrous)

Aluminum Co. of America, Gulf Bldg., Pitts., Pa.
American Brass Co., Waterbury, Conn.
Chase Brass & Copper Co., 236 Grand St., Waterbury, Conn.
Chicago Metal Hose Corp., 1315 S. 3rd Ave., Maywood, Ill.
Ducommun Metals & Supply Co., 219 S. Central Ave., Los Ang., Cal.

Tubing (Steel)

Dahlstrom Metallic Door Co., Buffalo St., Jamestown, N. Y.
National Tube Co., Frick Bldg., Pitts., Pa.
Ohio Seamless Tube Co., Shelby, O.
Service Steel Co., 1435 Franklin St., Detroit, Mich.
Summerill Tubing Co., Bridgeport, Montgomery County, Pa.

SHOP EQUIP'T

Air Reduction Sales Co., 60 E. 42nd St., N. Y. C., N. Y.
Air Transport Equipment, Inc., Roosevelt Field A, Garden City, N. Y.
Albertson & Co., Sioux City, Ia.
American Chain Division, American Chain & Cable Co., Bridgeport, Conn.
Avon Tool & Machine Co., 342 Xenia St., Dayton, O.
Binks Mfg. Co., Chi., Ill.
Black & Decker Mfg. Co., Towson, Md.
Blackhawk Mfg. Co., Mil., Wis.
Breeze Corporations, 24 S. 6th St., Newark, N. J.
Brunner Mfg. Co., 1821 Broad St., Utica, N. Y.
Chambersburg Engineering Co., Chambersburg, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., N. Y. C., N. Y.
Chicago Rawhide Mfg. Co., 1296 Elston Ave., Chi., Ill.
Continental Machine Specialties, 1301 Wash. Ave. S., Minneapolis, Minn.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Devilbiss Co., Toledo, O.
Engineering & Research Corp., Wash., D. C.
Ex-Cell-O Aircraft & Tool Corp., 1200 Oakman Blvd., Detroit, Mich.
Goddell Pratt Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haskins, R. G., 4636 W. Fulton St., Chi., Ill.
Heald Machine Co., 149 Broadway, N. Y. C., N. Y.
Hobart Brothers Co., Troy, O.
Homestead Valve Mfg. Co., Box H, Corapolis, Pa.
Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chi., Ill.
Ingersoll-Rand Co., 11 Broadway, N. Y. C., N. Y.
Linde Air Products, 30 E. 42nd St., N. Y. C., N. Y.
Manley Mfg. Div., American Chain & Cable Co., York, Pa.
Milburn Alexander Co., 1418 W. Balt. St., Balt., Md.
National Battery Co., 1728 Roblyn St., St. Paul, Minn.
Paasche Air Brush Co., Chi., Ill.
Pennsylvania Aircraft Syndicate, Wilford Bldg., Phila., Pa.
A. Schrader's Son, Div., Scovill Mfg. Co., 470 Vanderbilt Ave., B'klyn., N. Y.
Skilsaw, Ind., 3310-20 Elston Ave., Chi., Ill.
South Bend Lathe Works, 425 E. Madison St., S. Bend, Ind.
Smith Welding Equipment Corp., Minneapolis, Minn.
Stanley Works, New Britain, Conn.
Starrett, L. S. Co., Athol, Mass.
Union Carbide Co., 205 E. 42nd St., N. Y. C., N. Y.
Union Special Machine Co., 400 N. Franklin St., Chi., Ill.
United States Electrical Tool Co., 2490 Riverside Dr., Cincinn., O.
Van Dorn Electric Tool Co., Towson, Md.
Walker Mfg. Co., Racine, Wis.
White, S. S. Dental Mfg. Co., 10 E. 40th St., N. Y. C., N. Y.
Worthington Pump & Machinery Corp., Harrison, N. J.
Yale & Towne Mfg. Co., Stamford, Conn.

JOBBERS

Aero Supply Mfg. Co., 61 W. Main St., Corry, Pa.
Air Associates, Garden City, N. Y., Chi., Ill., Glendale, Cal.
Air Transport Equipment, Roosevelt Field, Garden City, N. Y.
Aircraft Steel & Supply Co., Wichita, Kans.
Bredouw-Hilliard Aeromotive Corp., Municipal Airport, Kans. City, Mo.
Ducommun Metals & Supply Co., 219 S. Central Ave., Los Ang., Cal.
Johnson Airplane Supply Co., Dayton, O.
Karl Ort, York, Pa.
Pacific Airmotive Corp., United Airport, Burbank, Cal.
Pacific Scientific Instrument Co., 1206 Manle Ave., Los Ang., Cal.
Vimalert Co., 807 Garfield Ave., Jersey City, N. J.

MISCELLANEOUS

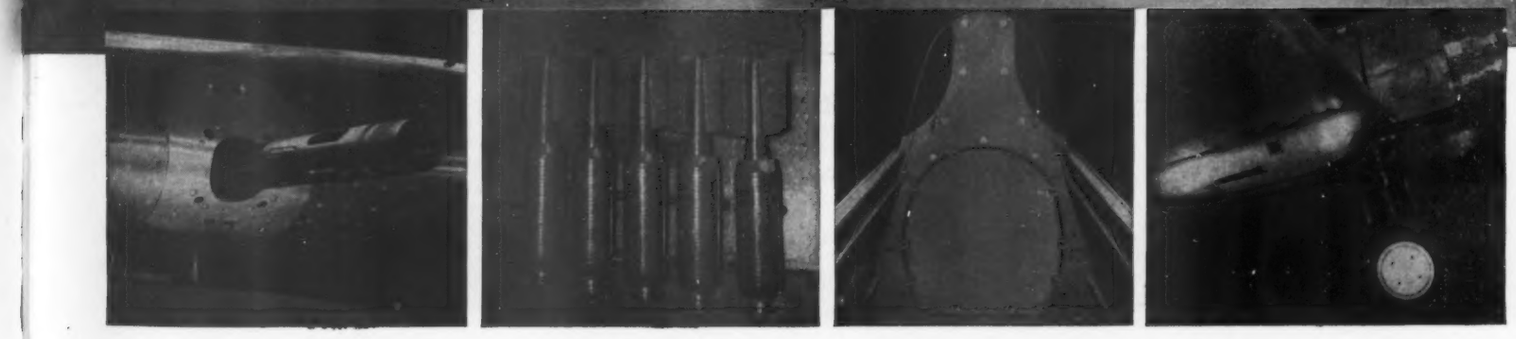
American Optical Co., Southbridge, Mass.
Cowden Mfg. Co., Water St., New Haven, Conn.
Eastman Kodak Co., Roch., N. Y.
J. V. W. Corp., 534 Broad St., Newark, N. J.
Meyrowitz E. B., Inc., 520 5th Ave., N. Y. C., N. Y.
Weems System of Navigation, Annapolis, Md.
Willis & Geiger, Inc., 11 W. 25th St., N. Y. C., N. Y.

The NEW CURTISS PURSUIT

Maximum Striking Power

WITH

PURSUIT SPEED



WING GUN INSTALLATION | BOMB INSTALLATION | HEAVY ARMOR PLATE PROTECTION | AIRCRAFT CANNON INSTALLATION

● The versatility of the new Curtiss Pursuit may be supplemented with additional combinations of armament to make it the most effective striking unit of modern aerial warfare.

As a pursuit airplane, two synchronized machine guns of 30- or 50-caliber are installed in the fuselage. For ground attack missions, the airplane may be equipped with wing bomb racks and two or more sets of wing guns to supplement the synchronized fuselage guns.

As a bomber-interceptor fighter, the plane may be equipped with two fast-firing cannons of from 20 to 37 mm., as desired. As a swift bomber, the plane may carry ten 25-lb. chemical bombs, ten 30-lb. fragmentation bombs, or six 50-lb. demolition bombs, mounted on racks on the underside of the wing.

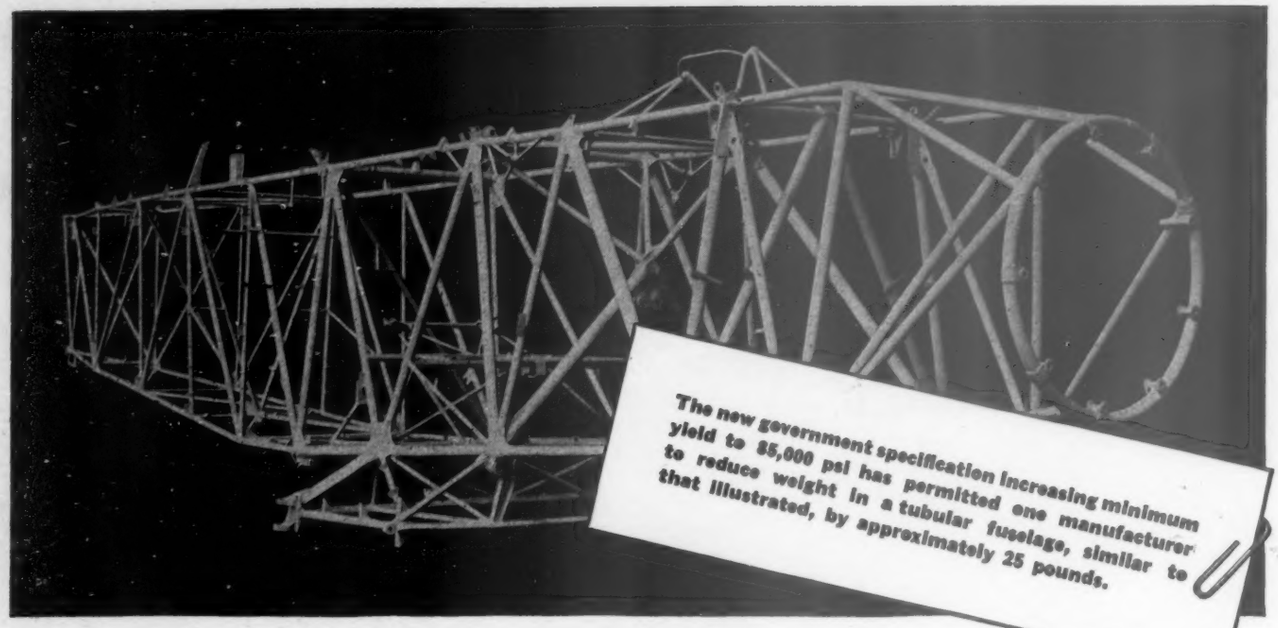
As a bomber with pursuit speed performance and maneuverability, a rack may be supplied which will accommodate a 500-lb. bomb under the fuselage, in addition to wing bombs and pursuit armament.

Another outstanding feature of this airplane is a heavy armor plate to the rear of the pilot's cockpit, provided to protect the pilot should, under any circumstances, an attack be possible from the rear.

CURTISS AEROPLANE DIVISION • CURTISS-WRIGHT CORPORATION

Buffalo *"The Pioneers of Aviation"* New York

Curtiss


The new government specification increasing minimum yield to 85,000 psi has permitted one manufacturer to reduce weight in a tubular fuselage, similar to that illustrated, by approximately 25 pounds.

Is there any substitute for STEEL TUBING *when you give proper value to . . .*

PHYSICAL PROPERTIES
Weight-Strength Ratio, Fatigue Life, Impact, Compression, Tension, Torque, Bending and the combination of two or more.

AVAILABILITY
Present production volume of tubing can be increased at least 5 times (500%) in 30 to 60 days.

ADAPTABILITY
Steel tubing is today standard for many parts on all planes. It can be welded by at least three different methods. It lends itself readily to heat treatment to obtain a wide range of physical values. It can be formed, bent, shaped, etc., with moderate-cost equipment.

SUMMERILL TUBING COMPANY

BRIDGEPORT, MONTGOMERY CO., PENNSYLVANIA

STANDARD SIZE AIRCRAFT STOCKS ARE AVAILABLE FOR PROMPT DELIVERY

THE AVIATION NEWS

REVIEW, COMMENT, FORECAST

DANIEL SAYRE
C. F. McReynolds, *Pacific Coast*
Blaine Stubblefield, *Washington*
E. R. Lockin, *New York*

FEBRUARY 1939

F. D. Puts Program Up To Congress

(Story on page 80)

MAIDEN VOYAGE: The first of the Boeing-307 Stratoliners takes-off the field at Seattle on its first test flight. As AVIATION readers know, it is the first air line plane with cabin supercharged to permit normal operations up to 20,000 ft. Three are scheduled for early delivery to Pan American Airways. Eddie Allen, just finished with his long job on the 314, is in charge of these tests also. (Picture on page 89)

ROUTINE TRANSFER: Forty-eight big Consolidated patrol-bombers of Fleet Patrol Wing No. 1 last month left San Diego en route for the Caribbean war games. First stop was Coco Solo in the Canal Zone, 2,500 miles from the point of take-off. (Story on page 94)

F. D. R. Sets Air Program Cost at $331,000,000; Avoids Fixing Numerical Quotas for Plane Production

"DEVOID OF ALL HYSTERIA, this program is but the minimum of requirements. I trust, therefore, that the Congress will quickly act on this emergency program for the strengthening of the defense of the United States." Thus President Roosevelt closed his special message read to Congress on January 12th. Few State documents have ever contained proposals so vitally important to the aeronautical industry. Those parts of it dealing directly with our aerial forces are as follows:

"Careful examination of the most imperative present needs leads me to recommend the appropriation at this session of the Congress, with as great speed as possible, of approximately $525,000,000, of which sum approximately $210,000,000 would be actually spent from the treasury before the end of the fiscal year ending June 30, 1940.

"The survey indicates that of this sum approximately $450,000,000 should be allocated for new needs of the army, $65,000,000 for new needs of the navy, $10,000,000 for training of civilian pilots. . .

"In the case of the army, information from other nations leads us to believe that there must be a complete revision of our estimates for aircraft. The Baker Board report of a few years ago (recommending a strength of 2,320 airplanes—Ed.) is completely out of date. No responsible officer advocates building our air forces up to the total either of planes on hand or of productive capacity equal to the forces of certain other nations. We are thinking in the terms of necessary defenses and the conclusion is inevitable that our existing forces are so utterly inadequate that they must be immediately strengthened.

"It is proposed that $300,000,000 be appropriated for the purchase of several types of airplanes for the army. This should provide a minimum increase of 3,000 planes, but it is hoped that orders placed on such a large scale will materially reduce the unit cost and actually provide many more planes. . .

"If an appropriation bill can be quickly enacted, I suggest that $50,000,000 of the $300,000,000 for airplanes be made immediately available in order to correct the present lag in aircraft production due to idle plants. . .

"I suggest an appropriation of $110,000,000 to provide 'critical' items of army equipment which would be needed immediately in time of emergency (tanks, anti-aircraft batteries, etc.)

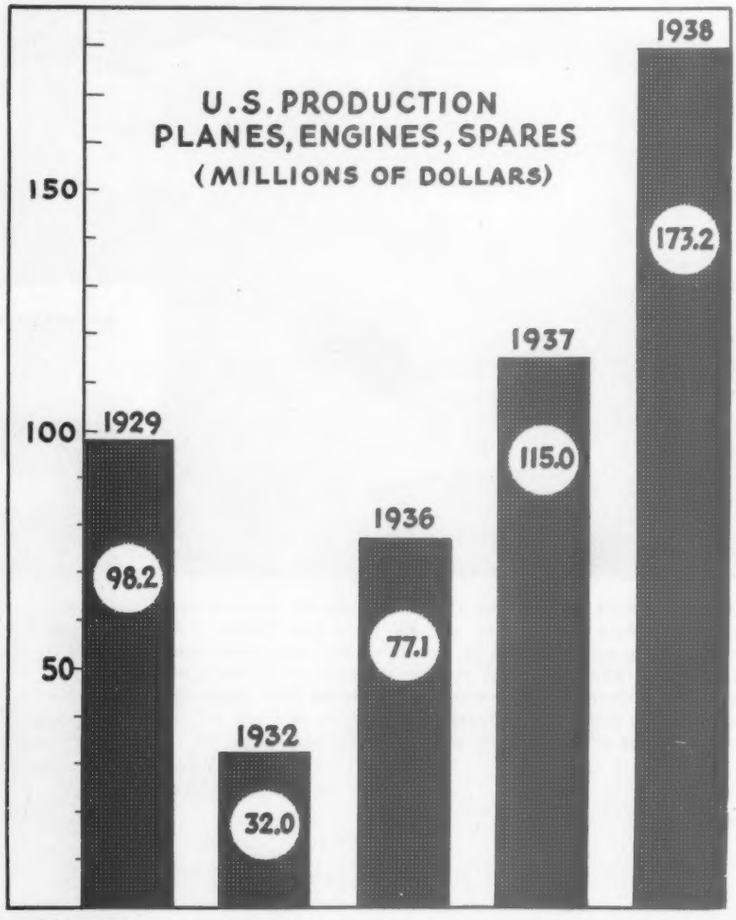
"The balance (of the army's share) should be used, I believe, for improving and strengthening the sea coast defences of Panama, Hawaii and the Continental United States. . .

"The estimated appropriation of $65,000,000 for the navy should be divided into (A) $44,000,000 for the creation and strengthening of navy bases in both Oceans in general agreement with the report of the special board which has already been submitted to the Congress, (B) about $21,000,000 for additional navy airplanes and air material tests.

"Finally, national defense calls for the annual training of additional air pilots. This training should be primarily directed to the essential qualifications for civilian flying. In cooperation with educational institutions, it is believed that the expenditure of $10,000,000 a year will give primary training to approximately 20,000 citizens. . ."

Immediate reaction to the message in Congress was reported as "mixed", but in the main most Congressmen reported a feeling of relief that the scale of the President's plans had been so "moderate". In a few cases, die-hard isolationists and those bitterly resentful of granting the administration further funds of any kind spoke in opposition. The general prognostication as we went to press was that the passage of the program substantially in its proposed form could be considered a near certainty. Guesses as to the rate of progress, which the suggested appropriations would make through Congress were more cautious. But it was certain that administration leaders in both houses would make every effort to get speedy action.

In considering the effects the program will have upon our air defenses, it is necessary to understand that the President had already in his regular budget message an item for $70,556,972, as the total direct appropriation for the Air Corps. This represented an increase of approximately $3,000,000 over the preceding budget and included some $30,-



1939 PRODUCTION—will depend on the speed with which Congress acts on the President's request for more air funds; the type of planes thereafter ordered by the War and Navy Departments; the number of units in which they are ordered; complex factors affecting our export business; the trend of air line developments; the general state of the nation's business. But adding it all up, we should go well over $250,000,000 this year, and give that total another big push upward in 1940.

000,000 for airplane procurement. Likewise, in his estimates of naval needs was included a figure of $41,261,047 for the "replacement of naval aircraft". This represented an increase over the previous budget of some $14,000,000. Thus the President's plans can be scored

(*Turn to page 94*)

Rogers Fixes Capacity At 5,500 Military Planes A Year

Aero Chamber survey finds industry can meet demands without straining

QUOTABLE REACTIONS from individual manufacturers to the President's defense message were understandably scarce last month. Congress had still to appropriate the requested funds; many practical details of program policy were still undisclosed—including those of possible changes in procurement methods and profits-control. But Leighten W. Rogers, president of the Aeronautical Chamber of Commerce of America, came forward in a well-timed statement to express the industry's readiness to stepup its efforts.

"Our survey shows that the industry can increase its military output more than twofold by hiring more labor and installing machinery to prevent possible bottlenecks in production lines," said Mr. Rogers. "In 1938 the industry's production aggregated approximately 3,675 planes of all types. Of that production there were 150 transports, 300 private and business planes, 1,425 lightplanes and about 1,800 military planes, including those produced for export. Yet, contrary to popular belief, the industry is nowhere near capacity production. Some of our important plants have practically no business.

"The 1938 average of 150 military planes a month was stepped up toward the end of the year. It now averages about 200 military planes a month. If a program demanded 5,500 planes a year, the industry could meet those requirements under the following conditions.

"It is assumed that such a program would be well-coordinated, calling for heavy four-motored bombers, light twin-engine bombers, pursuit planes and both primary and advanced trainers; and further, that the orders would be for types and models which are now in service or already have passed satisfactory service tests.

"Some plants which have produced only commercial planes would be available to participate in such a military program. No important factory expansion would be necessary for either the military or commercial manufacturers, although there might be minor additions in some cases. . .

"At the present time the industry employs about 36,000 wage-earners; and it is estimated that a 5,500 military plane program would raise that total to about 74,000 working in three shifts a day. Experience has shown that about six months would be required for training labor, and eight or nine month for tooling up and jig installation. But this does not mean that six months would be required to start production. Deliveries of most models could start immediately because they already are in production on present orders. As the plants completed their tooling operations, deliveries would increase progressively until at the end of eight or nine months full production would be reached.

"A significant fact developed by the survey is that such a program, contemplating large numbers of planes to be completed in a given time, would be dependent on contract specifications remaining unchanged. Changes in design or engineering specifications always slow up operations; and in a large program they would seriously disrupt the production line.

"Another important item is experienced management, executive and supervisory personnel. There can be no substitute for experience in the manufacture of aircraft. In all cases where outside industries or other groups have been charged with aircraft production programs the result has been delay and waste of funds.

SANE AND SAFE — An Editorial

SO MUCH TRIPE has been dished up in and around Washington and in the daily press about our needs for air defense that we were almost afraid to look for the President's defense message in the papers on the afternoon of January 12. Talk of building twelve or fifteen thousand airplanes practically overnight in huge, government-owned "shadow" plants to be manned by thousands of pilots to be turned out in government flying schools under Army and Navy instructors had cost us some sleep. Also repeated inference that we are in *immediate* danger of air attack by foreign powers had left us a bit sceptical as to the motive behind the distribution of such rumors. They sounded too much like build-up for somebody's political purposes to suit us. We couldn't help wondering how much the White House would swallow. But the rumors must have been without foundation, or else Mr. Roosevelt refused to be swayed by the scare-mongers. As far as aviation is concerned at least, the President's message seemed to us a very reasonable piece of business.

And why not?—for it fits in with the sort of program that AVIATION has stood for for years. As far back as January, 1936, we said editorially "—with conditions as uncertain as they are (in Europe), it seems only a measure of good sense to define the minimum requirements for our national safety and then build to that mark—". Again, in October, 1937,—"Technically our equipment can compete with anything anywhere, and our *potential* mass production manufacturing facilities cannot be matched. . . . But—with world affairs moving as they are, it is downright dangerous for us to dally much longer. . . . We must bring our defenses to the minimum required for national safety before we can start to look around. . . . The time has actually arrived which we predicted in . . . January, 1937, (Europe Rearms in the Air) when our own government must think in terms of thousands of aircraft rather than dozens or hundreds. . . ."

Coming down to November, 1938, on the point of departure for another European survey—"No urgent need to enter into any unbridled armament race with the rest of the world, but,—we must analyse our defense problem critically and lose no time in building up whatever land, sea, and air forces we need for national safety." And back from Europe two months later ("Box Score", AVIATION, January, 1939)—"we are well below the minimum strength for national safety at present. The most important thing that could be done at the present time would be to re-examine our defense problem rationally in the light of present world conditions, and to determine realistically the size and character of the air forces we need. We should then build to that level and then maintain that level at the highest possible efficiency."

"But don't let's get stampeded . . . (December, 1938)—let's forswear all rosy dreams that we can rush the aircraft industry overnight into mass production along the automotive pattern. . . . The answer is a coordinated step-by-step increase of airplane procurement over some practical period of time." Fortunately (January, 1938)—"we now have time enough to examine our problem critically, and to solve it logically without putting ourselves *unnecessarily* under a war-time pressure with its inevitable inefficiency and waste."

And those are just the things that we take it the President means to do from his message. We are to have a reasonable number of aircraft (as determined by our tactical experts) in a reasonable period of time (within the capacity of the present aircraft industry). We are to have a new and more rational system of procurement that will make use of plant capacity now idle because of current "feast or famine" buying policies. We are to have some sort of "assisted" training program geared in with the available facilities of our commercial aviation schools and fixed base operators.

We're with you one hundred per cent on all that, Mr. President! The next job is to sell the idea to the Congress, and then—Let's GET GOING!

S. PAUL JOHNSTON, *Editor*

AVIATION IN WASHINGTON

by BLAINE STUBBLEFIELD

FDR's Air Program deadpanned Washington. It wasn't spectacular enough or anti-climactic enough to excite cheers or jeers. Added up, the program means prosperity for the manufacturers and allied people. But it won't scare Adolf & Benito very much. Insiders say Louis Johnson is not disappointed; they say that he said we *might* have to triple or quadruple air power, but he never said *when*. They say the newspapers overplayed him.

CAA budget estimate for 1940 is $21,000,000 for all purposes as against $14,000,000 in the fiscal year of 1939, a fifty percent increase. The 1940 figure is a cut under what CAA asked for, variously estimated around $30,000,000. But no great harm is done; all main lines of activity will go ahead; airways and aids get $9,000,000 which adds up this way: $5,000,000 fresh case; $2,000,000 to pay for committments already made and partly under construction; permission to write $2,000,000 on the cuff. $18,000,000 was asked for two years. The Budget Bureau split it into two one-year items.

A Civil Air Committee for the Senate is proposed again in two resolutions, one by Sen. McCarran and one by Sen. Byrd. Talk in Washington is that the air transport people and CAA would like a permanent committee which could give all its time to increasingly complicated air business. The Commerce Committee which has always passed on aviation matters, has its lap full of other trouble. McCarran or Byrd would be in line to serve as chairman.

Lighter-Than-Air for Coast Guard is before Congress again in the perennial bill. It might possibly ride to enactment this time on the waves of defense expansion. Coast Guard will say at hearings, if any, that it could use bouyant craft to advantage on some problems.

Spare parts. Neither the Government nor aircraft manufacturers admit there will be a serious shortage of mechanics in production expansion, but disinterested persons say there *will* be. . . . A bill to provide for appointment of a Director of Aviation of the Marines, by Rep. Maas (Minn.), is not intended to create a new office or change the policy of the establishment, but merely to make the director a Brigadier General. . . . Grant Mason's report was held up so he would not scoop the President on national defense. . . . No more news about air express but don't blue pencil it.

Allen, Hinckley, Noble & Webster are not one of those Harvard law firms; they're the four who are said to have cooked up the 20,000-pilot scheme. Most competent on-lookers say it will work. Send to CAA for a copy of Grant Mason's Miami Speech, January 7; it's very informative. . . . Colleges near good training airports will get the bulk of the pilot training jobs. Training schemes in connection with established air schools are also on the fire, will be out soon.

Revision of patent law, by this Congress, is a possibility but probably it won't be drastic. Many similar attempts have failed. Patent authorities here say action might aim at (1) reduction of the 17-year protection period; (2) changing the law so that protection period begins with date of registration instead of date of issue; (3) imposition of a tax, nonpayment of which would lapse the patent. Patent-poolers will do well to watch the O'Mahoney-TNEC play. Compulsory licensing is out the window.

The Rotary wing story sums up like this: Last Congress authorized $2,000,000—but appropriated nothing—for procurement, service, testing, development and reporting to the Secretary of War on autogiros, by branches of Army, Agriculture, Interior, Treasury, Commerce, Navy, NACA, Post Office, and now of course CAA. Six giros were purchased with ready War Department funds and distributed among the establishments. Most or all of them have reported, more or less thoroughly, to the Secretary. The next move is an appropriation. This is another enterprise that will probably thumb a ride in the armament band wagon.

The C.A.A.'s Airport Survey is just about completed and will go to Congress on February 1 as scheduled, and will then be made public. Anybody can guess within three corn hills what the recommendations are, but few can confirm themselves, because CAA has set on the report like a hen on warm door knobs. The report deals with general principles rather than with details. The South was "surveyed" more than any other region because of favorable weather conditions there.

NACA tells Congress, in its excellent annual report, that the United States will have to snap to or drop behind some other countries in technology; that aircraft efficiency is as necessary as numbers to win a war. Probably by the time this is printed NACA will have asked for the money to expand and intensify its development work. The aeronautical scientists are pleased as their distinguished member, Col. Charles A. Lindbergh, gives them the benefit and prestige of his reports.

Transportation Coordination, talked for years past, is off to a real start with a proposal by Rep. Clarence Lea. Broadly, any new setup would put rate making and economics for rail, automotive, water, and air under a central authority, while safety and other operating regulations would remain with the individual agencies. Inasmuch as air rates are a "specialty", based on speed, air transport would not be disturbed for some time to come. Neither Mr. Lea nor other congressmen who created CAA would be willing to operate on aviation again while its stitches are still itching.

Trans-Canada's short-cut across Maine's grass has caused soft-glove sparring between the US and the Dominion for months. CAA drafted a proposed permit but Maine politicians resented Washington Democrats giving away rights to other foreigners to fly over their potatoes. They talked of asking Trans-Canada to land up there somewhere. International horse dealers wanted to swap the Maine right-of-way for an inland passage to Alaska. Now it looks as if we don't want that after all. There will be a happy ending, you can depend on that.

Government air travel is still off as a result of FDR's order that department heads scrutinize all applications carefully. Transport people's request that the order be modified apparently was ignored. But the word now is that the matter will come up again when passenger rate fixing is considered. Some Washington departments enforce the order to the letter; others roll along about as usual. In most cases air travel for G-employees can be "justified" if an effort is made to do so. Air traffic men are adroit helpers in finding proofs of "savings".

CAA needs room, and will rush buildings which it will occupy at new National Airport. Only a handfull of personnel has been added, but authority members take more executive space, as does the press section. And the Authority is bound to expand, despite itself, Congress, the tax-payers and high water. So far as we know, this will be the first location of a major enterprise at an air terminal—in keeping with the Brave New World.

Dictated Powers will increase their sales of airplanes at "dumping" prices in the world market. Again the warning is repeated that the U. S. will soon or late find its aviation in the same position as ship construction — needing subsidy shots in the arm to stay alive.

CRUCIBLE STEEL CHATS

CRUCIBLE STEEL IS *geared* TO YOUR PRODUCTION NEEDS

You're sure when you specify Crucible Aviation Steels! For on the basis of outstanding performance to rigid specifications, the Crucible organization is the leading Steel supplier to the Aviation Industry.

Crucible is highly enthusiastic about the well-deserved future of the Aviation Industry. For our role, we have geared our organization to meet the imminent demands of this coming great Aviation Era . . . increased coast-to-coast Branch Warehouse stocks . . . increased plant and laboratory facilities!

When our representative next calls upon your organization, be sure to ask him about our complete Quality Steel Service for every Aviation need!

Literature available upon request.

Specialty Steelsmiths to INDUSTRY

CRUCIBLE STEEL COMPANY of America

CHRYSLER BUILDING • 405 LEXINGTON AVENUE • NEW YORK CITY
BRANCHES AND WAREHOUSES IN ALL PRINCIPAL CITIES

CONSULT TELEPHONE DIRECTORY
THOMAS' REGISTER FOR NEAREST O

MAKERS OF HIGH SPEED, TOOL, STAINLESS, PRODUCTION AND SPECIAL PURPOSE STEELS.

Curtiss-Wright Shows off New C-W 21 Interceptor
First-Minute Climb Reported Best On Record

SOMETHING REALLY NEW in military air craft went droning up into the air last month above St. Louis, Mo., and again over Dayton, Ohio—Curtiss-Wright had begun testing and demonstrating it's new C-W 21 "Interceptor". Powered with a single Wright R 1820-G5 Cyclone rated at 1,000 horsepower at take-off, the new ship is, as far as we know, the fastest climbing aircraft that has ever been flown. You don't believe it? We have it on excellent authority that it has done a first-minute full-throttle climb of a few feet better than one vertical statute mile—Something slightly better, that is, than 5,280 ft. per minute.

The plane's astounding climbing powers are by no means it's sole claim to good performance ratings. It has a maximum speed at 17,000 ft. of over 300 m.p.h., a maximum speed at sea level of over 260 m.p.h., a cruising speed at 17,000 ft. of over 270. Stalling speed is given as 68 m.p.h. The plane's absolute ceiling is 36,500 ft. Its service ceiling is 1,000 ft. less. Cruising range at 600 b.hp. is 592 miles, at 500 b.hp. it is 630 miles.

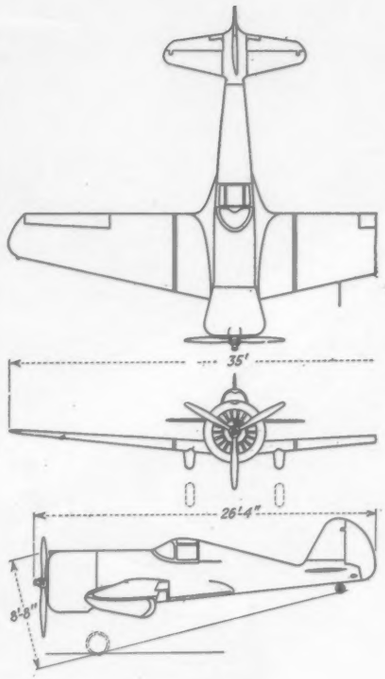
The significance of such a ship in modern air strategy can hardly be overemphasized. More orthodox pursuit planes, no matter how excellent in general performance, are at a marked disadvantage when called upon at sudden warning to assume the defense against high flying attack by high speed bombers. A plane such as the CW-21 which will be able to take off and climb to altitudes of 20,000 ft. in less than six minutes may prove the long sought solution for the defense of prime military targets and congested municipal areas.

The C-W 21 is a low-wing, single-place all-metal job, whose basic design objectives have been high speed, rate of climb, maneuverability and fire power. Although such requirements put great premiums on weight saving, the C-W 21 has a high-angle load factor of 10 calculated by U. S. Army Air Corps methods.

The wing, of riveted internally braced multicellular dural construction, is built in three sections; right hand outer panel; center section; left hand outer panel. The wing tips are removable. Flaps are of the split type and are mechanically operated through a chain drive from the cockpit. Ailerons are dynamically and statically balanced and are provided with fixed tabs for ground adjustment of wing heaviness.

The fuselage is of semi-monocoque riveted dural construction, riveted to the center section of the wing through high strength angles. The tail cone is removable. Provision is made for a baggage compartment aft of the pilot. Turn-over bracing for protection of the pilot in event of nose-over is built into the structure. The engine mount is of welded Chrome molybdenum steel mounted in anti-vibration shock absorber units of rubber. Complete power plant forward of firewall is designed to be interchangeable in ten man-hours of time. Above the cockpit is a wind shield and sliding canopy of transparent plastic material, adjustable in flight for ventilation. Locking can be operated from inside or outside.

Unique feature is the incorporation in the fuselage structure directly behind the pilot of a brace wall capable of standing a force of 18,000 lbs. The forward wall of this brace is a one quarter inch bullet proof sheet steel bulkhead, thus comprising protection to the pilot against machine gun fire from the rear. An additional plate of the same material may be installed on the lower portion of the same bulkhead thus providing protection for the lower portion of the pilot's body also. With the radial engine serving as a shield in the front, the parachute and seat serving as protection from gun fire from below, the pilot is thus protected from all the most dangerous directions.

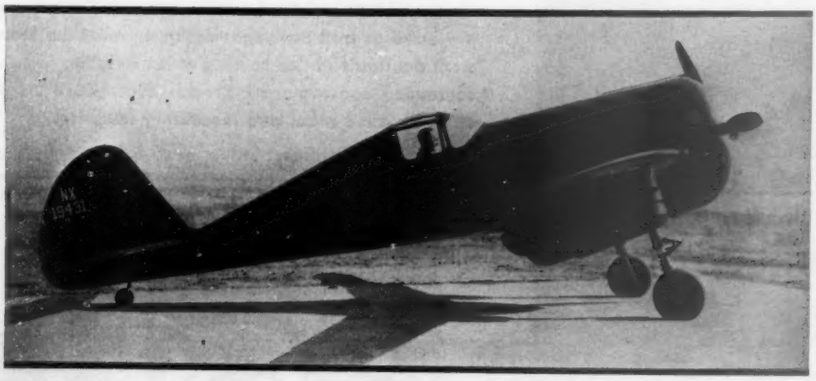


The landing gear is of the retracting cantilever type using removable 6.5x10 tires and 7.50x10 Goodyear hydraulic wheels. The air and oil oleo unit has eight and one-half inches of travel. The gear is retracted by hydraulic cylinders connected to an accumulator tank. Wheel fairing opens automatically with the gear and fares into the center section when closed. The tail wheel uses an 8-inch streamlined tire and is mounted in a single side fork steerable through limits of the rudder travel. It is full swiveling.

The tail control group consists of a fixed one piece stabilizer. The elevator is dynamically and statically balanced and is equipped with trim tabs controllable from the cockpit. The fin is also fixed and is offset for trim at cruising. The rudder is dynamically balanced and also has a controllable trim tab.

The Cyclone engine is equipped with a two speed supercharger and a Chandler Groves carburetor model 1375-C. The fire wall is a ½-inch asbestos sheet mounted between two layers of aluminum alloy. The propeller is a Hamilton-Standard Constant Speed, has three blades and is 9 feet in diameter with 20 degrees of pitch range. The fuel system consists of two 34 gal. tanks in the center section and one tank of 14 gal. mounted in each outer wing panel. Total capacity 96 gal. The oil tank holds 8.5 gal. and provides one gallon of expansion space.

Standard military armament consists of one MG-40 (30 caliber) machine gun



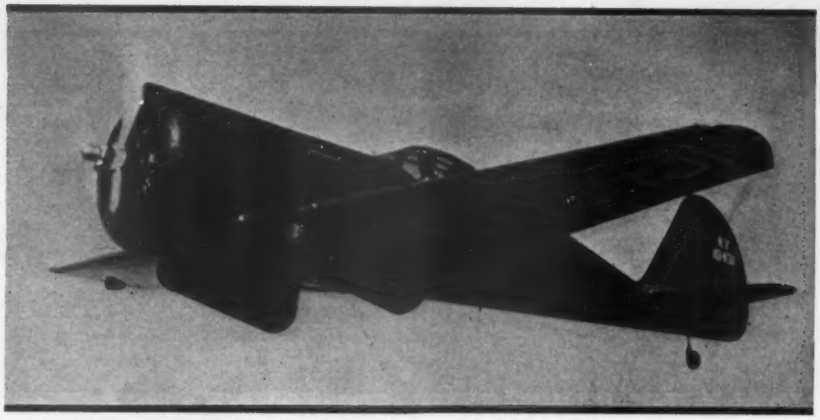
YOU CAN TELL FROM THE LINES—that the C-W 21 is no orthodox product of step-by-step refinement, but a bold departure toward new goals.

and one MG-53 (50 caliber) Colt-Browning machine gun.

As mentioned before low weight was at a high premium throughout the process of design. The weight empty as a result is only 3,050 lbs. Useful load includes fuel at 576 lbs., oil at 64 lbs., ordnance at 190 lbs., pilot and parachute at 190 lbs., oxygen equipment at 22 lbs. The total normal gross weight is thus 4,092 lbs. and since the G-5 cyclone alone accounts for 1,183 lbs., the ship emerges as a real triumph for Curtiss-Wright's structural specialists.

The wing span of the plane is 35 ft. overall. It has an overall length of 26.5 ft. and an overall height of 9.75 ft. Figures on wing area are not given but it can be seen from the attached three-view drawing that the aspect ratio is higher than for the more orthodox pursuit designs.

LIGHTWEIGHT STRENGTH: The fuselage structure of the C-W 21 is of simple semi-monocoque design. Weight-saving was held at a premium yet the ship retains a high load-factor rating and a quarter inch steel plate has been incorporated aft the pilot's seat for protection against gunfire. Gross weight is hardly two tons.



LOOK OUT MAGUIRE! The C-W 21 interceptor's rate of climb is the closest thing to a rocket yet seen in an airplane.

First Lockheeds for R.A.F.

Flight tests rushed. Deliveries start on 200 bombers. Kerber joins staff.

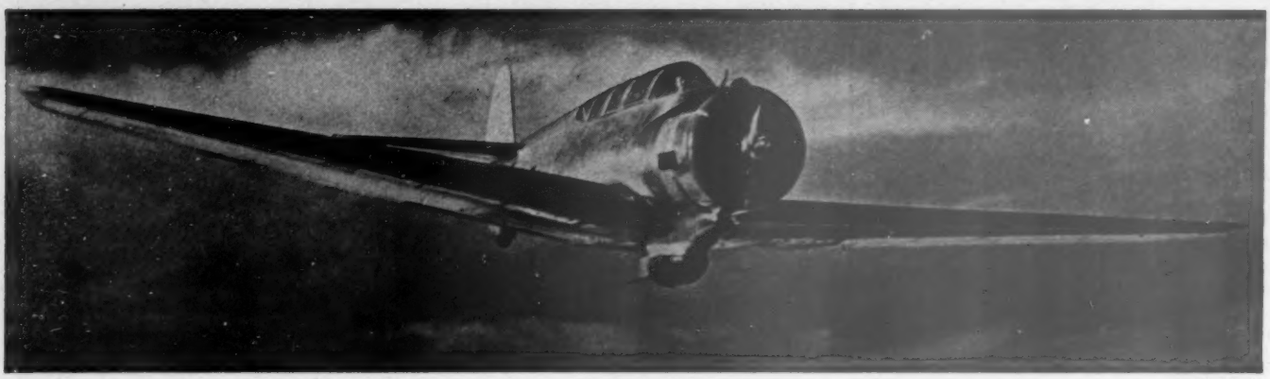
LATE IN DECEMBER the first of 200 Lockheed reconnaisance-bombing planes for the British Royal Air Force was given preliminary flight tests at the Lockheed Aircraft factory, Burbank. Performance tests are under the supervision of Marshall Headle, Lockheed chief test pilot, and will be checked by Squadron Leader James Addams, of the British Air Ministry. With a backlog of unfilled orders now exceeding $30,000,000, the Lockheed factory currently employs about 3,000 men on a two-shift per day, 40-hour week basis. Among commercial orders recently announced is a repeat order from British Airways for two more Lockheed-14 transports. Expansion of Lockheed's domestic sales organization has been announced by Carl B. Squier, vice-president in charge of sales, with appointment of L. V. Kerber as direct factory representative in Washington, D. C. Kerber, formerly with the aircraft airworthiness section of the Bureau of Air Commerce, has also served with the Army Air Corps, was at one time president of the Spartan Aircraft Co.

Vega Buys Factory

AN ANNOUNCEMENT by Mac Short, president of Vega Airplane Company, reveals the purchase of six and one-half acres of land, together with a factory building, adjoining the Lockheed plant in Burbank, Calif. The factory has about 77,000 sq. ft. of floor space, of which Vega is already utilizing some 40,000 sq. ft. An extensive flight test program is being conducted with a Lockheed Altair converted to act as a flying test stand for the UniTwin power unit which the Vega will feature. Vernon Dorrell, test pilot, has made repeated full load landings and take-offs with one of the two Menasco engines completely shut off. Using only a single engine, the airplane took off in 1600 ft., which compares with a run of 800 ft. when both engines are used. The UniTwin power plant uses a single constant speed propeller driven from the two engines through a set of over-running clutches which automatically disengage in event of stoppage of either engine. The Vega is to be ready for flight testing early this Spring.

Wide World

HANDS ACROSS, ETC.: Squadron Leader J. Addams of the R.A.F. congratulates Lockheed engineer C. L. Johnson on the first of the B-14's, shipped to England last month.



Wide World

VERSATILE: The Vultee-V 12 attack-bomber caught by the photographer in a dramatic pose. It carries a crew of three, six machine guns, 3,000 lb. of bombs, can range at high speed over 2,000 miles. Span is 50 ft.; length 37 ft. 6 in.

Bellanca Files With SEC

BELLANCA AIRCRAFT CORP. has filed a registration statement with SEC covering 100,000 shares of $1 par value common stock. Tobey & Co., underwriters, have agreed to purchase 5,000 shares at $6.50, with privilege to buy an additional 45,000 shares at the same price, and 50,000 further shares at $8.50 after purchase of the first 50,000 shares. Proceeds of the sale, estimated at $742,000, will be used to develop and construct two military types; to enlarge plant facilities; to cover material and labor before payments on contracts which may be received for military aircraft, Bellanca Juniors, and other models; and possibly to extend operations in Canada.

The SEC registration data revealed that, although no final contract has been made and no order actually has been placed, Bellanca has negotiated a tentative agreement with the Chinese government (through Dr. L. H. Hsu, counselor of the Commission of Aeronautical Affairs of the Chinese Republic) for the purchase of 200 Model 28-90Bs, multi-purpose, fighter-bomber land-planes, at $39,500 each, exclusive of armament amounting to $1,800 each. The Bellanca Company has also had agents in Greece and Brazil to promote the sale of its planes to those governments.

New Army Contracts

WAR DEPARTMENT CONTRACTS for aviation supplies, have been awarded to Pittsburgh Screw & Bolt Corp., $57,000; Ohio Seamless Tube Co., $53,684; Bendix Aviation Corp., $49,152; Niles-Bement-Pond Co., $50,870; Joseph T. Ryerson Sons, $27,300; Jones & Lamson Machine Co., $25,825; Bausch & Lomb, $24,957.

Howard Raises $1,000,000

ANOTHER STOCK ISSUE announced is that of Howard Aircraft Corp. of Chicago. Pistell, Wright & Co. have underwritten a $1,000,000 issue of common stock to be applied to the immediate expansion of the Howard factory. This is to take care of the production of a new 20,000 lb. freighter, which, like the single-engined planes, will be constructed entirely of wood. The projected freighter will have a single cantilever wing placed on top of a large, round hull.

Exports Up 76 Per Cent

REFLECTING the sharp upward trend of the industry, the Bureau of Foreign & Domestic Commerce reports total exports of aircraft, engines and accessories amounting to $62,439,412 for the first eleven months of 1938. This represents a 76 per cent increase over the same period in 1937. Breakdown of the 1938 figure shows 715 aircraft units exported totalling $34,561,047 (a 77% increase); 1,191 engine units totalling $7,067,107 (a 30% increase); a total of $378,650 for parachutes and parts (a 59% increase); and a total of $20,432,608 for parts and accessories (a 100% increase).

Friedlander Would Save Spruce

CARL I. FRIEDLANDER, vice-president and general manager of the Aeronautical Corporation of America, has dispatched a plea to President Roosevelt, Secretary Ickes, the State Department, and government leaders, urging an embargo on the exportation of airplane spruce. Friedlander contends that "as spruce is vital to light aircraft development, its export to foreign countries is a menace to the general welfare of the United States, providing ample grounds for an immediate embargo".

Douglas Has Record Year

DOUGLAS AIRCRAFT CO., closed its fiscal year ended November 30, last, with the establishment of new records in sales volume and earnings for any one year in the history of the company, and had on hand a backlog of orders sufficient to carry it through another year at full production. Sales for the year totalled approximately $27,600,000, compared with $20,950,361 for 1937, the best previous year. Profits for the full year were expected to exceed $3.25 per share, which compares with $1.90 a share in 1937, and $2.70 per share in the peak year of 1935. The backlog of unfilled orders is estimated at $23,800,000.

Boeing Promotions

BOEING AIRCRAFT CO. has elected Jay Morrison as assistant to the president. Mr. Morrison is vice-president of the Washington Mutual Savings Bank of Seattle. Robert J. Minshall, vice-president of engineering, has been named assistant general manager, and John Kylstra has been appointed chief engineer.

McClane To Manage Seversky

J. L. MCLANE has been appointed general manager of Seversky Aircraft Corp. Joining the company in 1936 as executive engineer, he later became general manufacturing manager. McClane has been connected with the industry for 21 years, having started as one of the nucleus of old McCook Field.

Gets Fabric Contract

SUNCOOK MILLS has received a contract from the Navy Department for 35,000 yards of 69 inch Grade A airplane fabric, to be shipped to Pensacola and San Diego for overhaul and recovering purposes. The company has completed half the order for 425,000 yards of 36 inch Grade A fabric placed by the Army Air Corps.

Macwhyte Branch In Seattle

A BRANCH OFFICE AND WAREHOUSE has been opened at Seattle by the Macwhyte Company of Kenosha, Wis., with H. A. Kamp in charge. The Macwhyte Company is proud of a plaque presented to Walter R. Bloxdorf, metallurgist, by the Wire Association, for his paper on the metallurgic processes in the manufacture of rope wire.

The CW-20 Transport

To its long line of successful airplanes the St. Louis Airplane Division of the Curtiss-Wright Corporation now adds the CW-20 Transport, powered by two 1600 H. P. Wright double-row Cyclone Engines and equipped with Curtiss Electric "Full Feathering" Propellers. Outstanding features of this luxurious 30-passenger transport are as follows:

FOR PROFIT

Reduced Operating Costs . . . Optimum Size To Meet Actual Traffic Demand . . . Simplified Maintenance Permitting Intensive Scheduling . . . Cargo Capacity 588 Cubic Feet—6000 Pounds . . . 30 Passengers (38 Maximum).

FOR COMFORT

Automatic Pressurization and Air Conditioning—Low Level Comfort At High Altitudes . . . Luxurious Cabin Appointments . . . Improved Sound-Proofing . . . Restful Reclining Seats—Spacious Accommodations . . . Club Section—Swivelling Seats—Tables . . . Indirect Glareless Lighting: Individual Reading Lights . . . Perfectly Appointed Ladies' Lounge and Men's Dressing Room.

FOR SAFETY

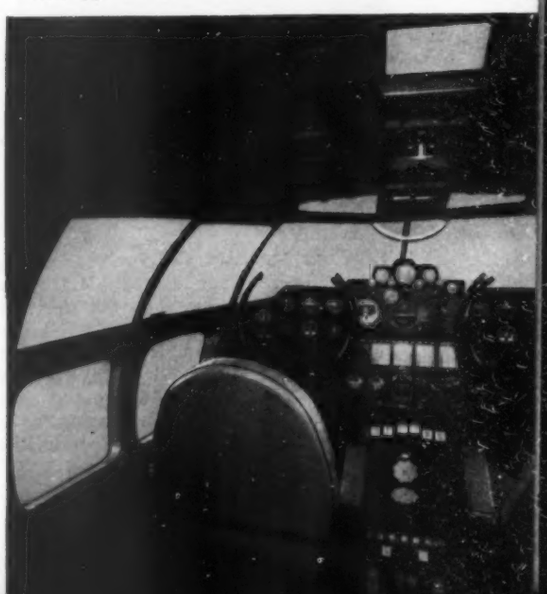
Automatic "Tell-tale" Instrument Check System . . . Number of Controls Reduced 37% . . . Ice-Free Carburetion: Non-Icing Ailerons . . . Special Curtiss-Wright Landing Flaps . . . Landing Gear Retraction in 5 Seconds—Faster, Safer Take-Off . . . Special Curtiss-Wright Wing Design—Effective Control At Low Speed.

FOR PERFORMANCE

Cruising Speed Over 200 M.P.H.—Top 237 M.P.H. . . . Landing Speed 66 M.P.H. . . . Superior Take-Off and Landing Characteristics . . . Sea Level Rate Of Climb 1440 Ft. Per Minute . . . High Single Engine Ceiling—14,800 Ft.

The spacious passengers' cabin of the Curtiss-Wright CW Transport showing arrangement of the seats.

The pilots' compartment showing arrangement of instrum new type control wheel and the "tell-tale" instrument p



CURTISS-WRIGHT CORPORATION

Sperry Promotes Wildman

SPERRY GYROSCOPE Co. has switched C. K. Wildman from technical assistant to the vice-president, to Director of Flight Research, in which capacity he will coordinate new engineering developments with the requirements of transport and service aviation units. Wildman saw service with the Navy during the late war, is credited with more than 4,500 hours of flying, and has been connected with Ingersoll-Rand, the Aeronautics Branch of the Department of Commerce, and the Naval Aircraft Factory. He came with Sperry two years ago after serving as Senior Pilot for Pan American.

Du Pont Licensed by Martin

UNDER A CONTRACT just completed between the patent-holder, The Glenn L. Martin Company of Baltimore, and E. I. du Pont de Nemours & Company of Wilmington, Del., the latter company is placed in position to market the recently announced "Mareng Fuel Cell" to the entire industry.

The new cells are made of du-Pont "Neoprene", a light fabric impregnated with synthetic rubber, and can be described as over-sized "inner tubes". They were developed by Martin engineers after several years of research aimed at producing an airplane gasoline tank less susceptible to damage from vibration than metal tanks. In addition, the cells have demonstrated the further advantage of superior resistance to corrosion, due to the fact that synthetic rubber is not affected by either gasoline or water.

Profits for Precision Products

DELIVERIES of Aircraft Precision Products, Inc., of Los Angeles, totalled $31,-164.01 during November, 1938, according to a report by C. A. Herberts, president. December deliveries, not available at time of writing, were said to have materially exceeded November. A small profit for the first eight months operations of the company were forecast in the statement. J. Bert Easley has been elected secretary of the company and T. M. Deal has been made a director.

Robinson Buys Kinner

THE ASSETS of Kinner Airplane & Motor Corp., Glendale, Calif., have been sold to B. B. Robinson and a syndicate of investment brokers. The Kinner Co. has been operating under bankruptcy laws for some months, with Earl Herring acting as trustee. Operations and sales have been improving and engine development work has been in progress. The new owners of the assets are reported planning immediate expansion of Kinner engine manufacturig operations. Sale price was reported at $200,-000. Approximately $82,000 is reported still owing to the R. F. C. under a Federal loan negotiated prior to reorganization proceedings.

Ryan Expands Facilities

A MAJOR 1939 EXPANSION PROGRAM has been announced by T. Claude Ryan, president of Ryan Aeronautical Company, San Diego. Factory buildings will be materially enlarged and a large amount of new manufacturing equipment is to be installed. Increased space will be provided for engineering, and for executive offices. Construction work is now under way on the Ryan Administration Building to provide the needed office and engineering facilities. The additional construction increases the tower section of the building to a full five stories. Factory expansion is to include addition of two new buildings providing an increase of approximately 17,000 sq. ft. of floor space. Equipment to be installed will expand facilities of the S-T and S-C airplane manufacturing departments, and of the contract manufacturing division which builds specialized parts for other aircraft manufacturers. Four more Ryan drop-hammers are to be installed to supplement the five hammers now in use.

PROFITS AND LOSSES

» AIR ASSOCIATES, INC., for fiscal year ending Sept. 30, 1938, net profit of $104,809 or 86c. each on 99,884 shares of common stock, against $83,390 or 77c. on 82,921 common shares for previous year. Net sales amounted to $1,844,522, an increase of $394,155 or 27 per cent over the total for the preceding year.

» BELLANCA AIRCRAFT CORPORATION, for ten months to Oct. 31, 1938, net profit of $202,652. For year ended Dec. 31, 1937, the corporation had a net income of $120,274. A final dividend of 40c. a share on the common stock was voted. The last dividend was 50c. paid in 4 per cent four-year notes Dec. 27, 1937.

» SOLAR AIRCRAFT CORPORATION, for 28 weeks ending Nov. 12, 1938, net profit of $41,997, equal to 25c. each on 169,318 shares. Compares with profit of $19,710 or 15c. each on 129,640 shares for same period last year. Net income for the 12 weeks ending Nov. 12, 1938 was $20,408 or 12c. a share. Current assets as of Nov. 13, 1938, $174,840; liabilities, $31,728.

» WACO AIRCRAFT CO., for year ending Sept. 30, 1938, net loss of $34,326; for nine months ending Sept. 30, 1937, net loss of $32,524, including $2,310 non-operating deductions. Net sales for year ending Sept. 30, 1938 were $747,909, compared with $877,244 for the same period in 1937. Current assets as at Sept. 30, 1938, $388,833; liabilities, $79,288.

THE I.A.E.S.—HAS ELECTED Dr. George Lewis its 1939 president.

—HONORED Prof. Alfred deForest of M.I.T. with the Reed Award for his magnaflux work.

—HONORED Russel Newhouse of Bell Labs with the Sperry Award for his Terrain Clearance Indicator.

AVIATION PEOPLE

Who's Who in This Month's News

NEW JOB: Harold M. Harrison (left), Vultee's new Factory Superintendent, looks over some work-in-hand with Don Carrol, Vultee Plant Manager. A graduate engineer, Harrison has served with Spartan, Boeing and Martin. Now 32, he has been in touch with factory work for eighteen years.

NEW JOB: Eddie Allen, nominated by most test pilot-engineers as U.S. No. 1 Test Pilot-Engineer, has just finished months of work on the big Boeing 314. Now, without even moving out of Seattle, he has begun putting the new Boeing 307 through a similar course of sprouts.

NEW JOB: Charles A. Boillod for the past ten years one of Pan American Airway's best known traffic men and for the past six Assistant to General Traffic Manager Vic Chenea, has been made P.A.A.'s Sales Manager for the United States.

NEW JOB: Stanley A. Hedberg, new Director of Public Relations for the Aviation Manufacturing Corp. has been an aviation publicist since 1927 —for the Aero, Chamber, United Aircraft, and, through the Essig Company, for many Southern Cal. leaders.

NEW JOB: Allan F. Bonaille, thirty-years an airman, World War pilot, and since 1930 superintendent of technical instruction at the Boeing School, is now assistant superintendent of flying for the Western Division of United.

LOGGING THE LINES

Air Transport Drift Sights

by DAN SAYRE

Every air line President whose press agent knows our name and address has sent us one of those review-forecast messages to the effect that 1938 was fine but that 1939 will be much finer. None of them were so rash as to guess just how much finer 1939 would be, but general confidence talk among our traffic friends is that the lines expect the two World's Fairs will have air line travel up at least 30% over 1938 by the middle of the summer . . . In any case, for the first time in months we have received bulletins on orders of new aircraft by domestic operators. American has ordered five more Douglas "Flag Ships" at a cost of $560,000. The actual order was placed last October. Deliveries are scheduled for between March and May. TWA has ordered three more Douglas "Sky Clubs" at an overall cost of approximately $350,000 . . .

More interesting than the 15 per cent increase in passenger traffic for all the domestic operators together, are the individual reports for the various companies that have been trickling in during the past month: TWA's traffic gained approximately 8 per cent; American was up 14.5 per cent; United about 10 per cent; Chicago and Southern reported a 32 per cent increase in passenger-miles; Braniff was up 25 per cent; Pennsylvania Central reported a 24 per cent increase in the number of passengers carried . . . American Airline's total of 358,295 revenue passengers for the year is, incidentally, a new World Record for any air line . . . Another World Record was the completion in January by United of its 25,000th transcontinental flight. This is equivalent to about 66,000,000 miles of flying.

The ICC is still with us. In what should be one of its final decisions directly concerned with air transport rates, that commission on December 28th, boosted TWA's mail rate. It ruled that the company's pay should have been 27c per mile between October 1, 1936, and June 30, 1937, instead of 24c as was paid. After July 1st, 1937, the commission held, the company was entitled to a base rate of 30c per mile on a base mileage of 600,000 miles per month. The immediate result was to shake $740,000 in retroactive mail pay off the Xmas tree into the TWA treasury. . . . Few days later a TWA spokesman revealed the line will apply to the CAA for a further rate increase on its transcontinental route and on it's three additional routes, "Because," he said, "TWA still receives a ratio of payment less than the air mail pound-miles flown by the company."

Another good will move on the part of our once furiously competing air lines took the form last month of a new Air Traffic Conference of America organized as a division of the Air Transport Association, its purpose being the handling of traffic agreements and the administration of traffic matters for the member air carriers of the association. Charles A. Rheinstrom of American is President. D. D. Walker of Chicago and Southern is first Vice President. R. W. Ireland, United, is second Vice President. M. F. Redfern, formerly of United, has been appointed full time manager.

Personally speaking: Jerry Lambert, Jr., of the St. Louis Lambert's, after four years with United as traffic man in New York and Hollywood, has joined Airline Feeder System, Inc., as assistant to Richard Crane, President . . . Gladys Entrekin, chief hostess for TWA's Eastern division for the past eight months, has been appointed chief hostess for the entire TWA system. Olga Harbaugh moves into Entrekin's former post . . . Trans-Canada Air Lines has named Herbert D. Harling as traffic representative in Toronto; Howard C. Cotterell as District Traffic Manager for the Winnepeg region . . . United has named Allan F. Bonnalie, long superintendent of technical instruction at the Boeing School, to be assistant superintendent of flying of its Western division (picture on page 89) . . . Howard Payne, Jr., formerly of American Airlines, has joined Air Associates to head up a division designed to cooperate with the air transport companies on problems of engineering, maintenance and the development of accessory equipment. Prime objective is to eliminate costly duplication of technical and shop effort in solving problems which are uniform with all operators using similar equipment . . . Norman B. Haley has been appointed treasurer of United Air Lines to fill the vacancy caused by the retirement of C. E. Brink. Haley, who leaves the position of Director of the CAA's Bureau of Economic Regulation, served with the ICC from 1910 to 1938.

AIR TRANSPORT INDICATOR

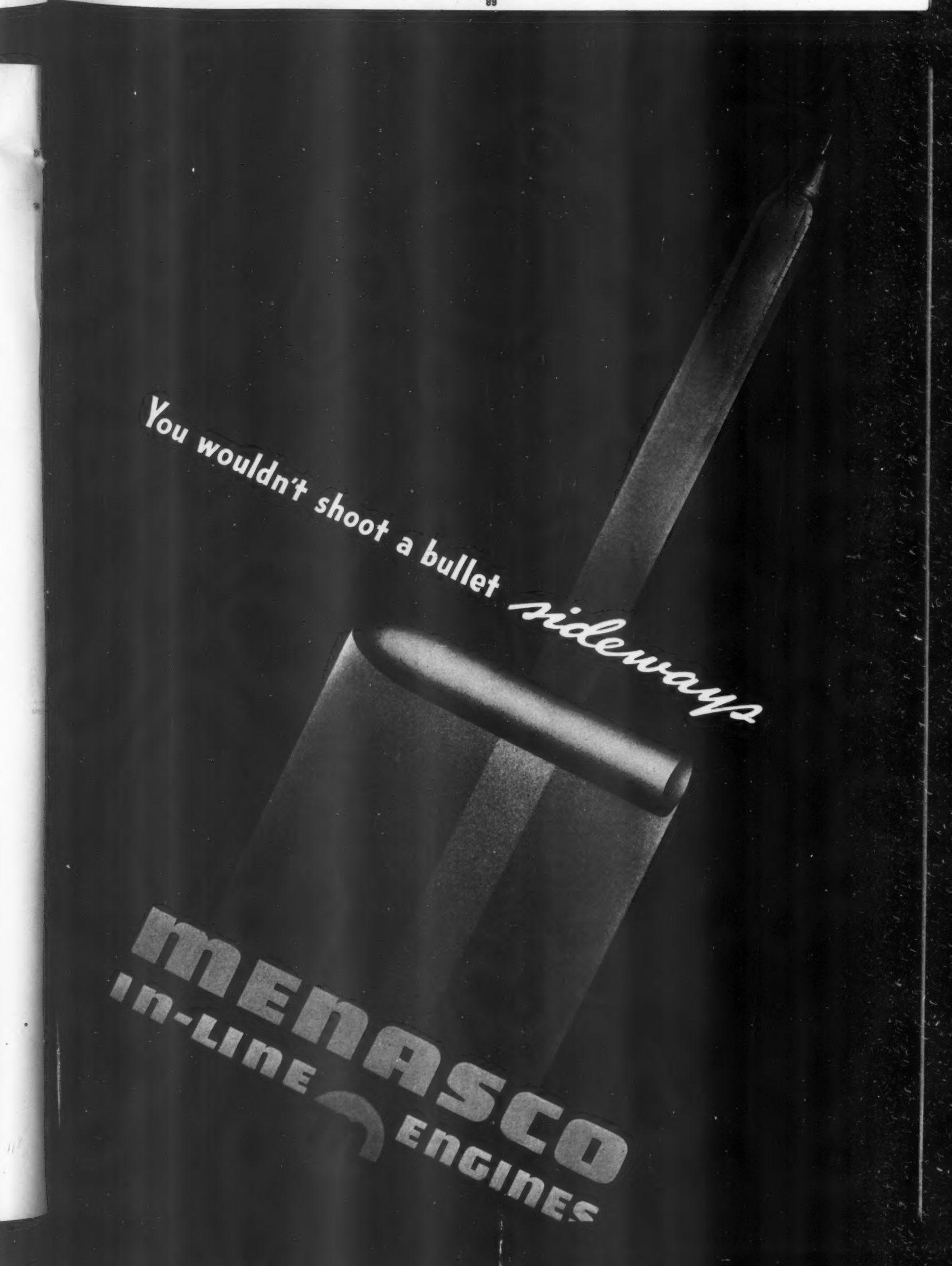
January 1, 1939

138.2

Which is the ratio of the revenue passenger miles reported by the Air Transport Association as carried by all domestic airlines during December, 1938, to the corresponding figure for December, 1937.

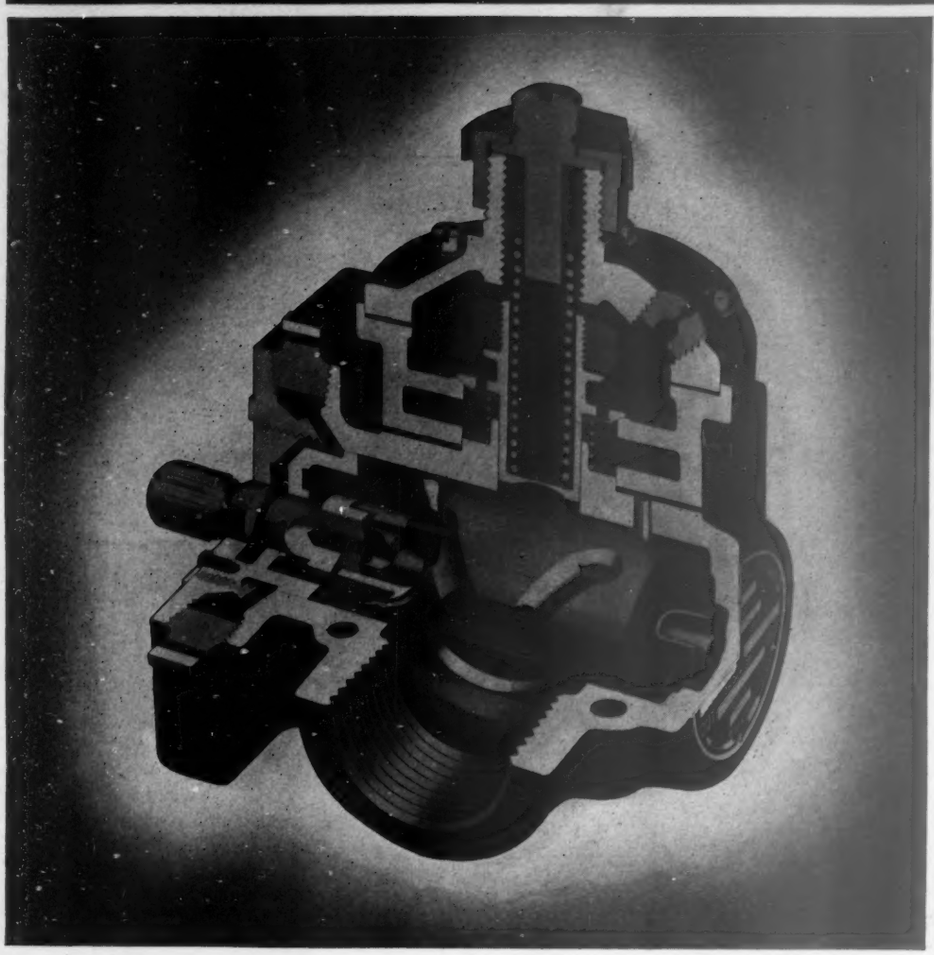
37,319,228 pass-mi. thus set the final twelve months totals: 1937—408,683,484; 1938—476,014,791, up 16.6 per cent.

ALL AMERICAN: Foreground, Vice-President Ralph Damon, First Officer Ted Jonson, President C. R. Smith. Background one of three new Stinsons American Airlines has purchased for instrument training.


You wouldn't shoot a bullet sideways
MENASCO
IN-LINE ENGINES

1100 SOLD BEFORE A PUBLIC ANNOUNCEMENT

—that's real confidence in PESCO PRODUCTS



PESCO R400 Series Fuel Pumps with Diaphragm type Relief Valve—capacity 165 gals. per hr. at 1750 RPM.

•

PESCO R600 Series. Same type—capacity 325 gals. per hr. at 1750 RPM.

Both R400 and R600 series are adaptable to the high pressures required for the new aircraft carburetors.

● With "an eye to the future" PESCO engineers have now perfected a fuel pump with a diaphragm type relief valve, which eliminates the fatigue failure of the metallic sylphon type. Years of exhaustive research and experimentation have resulted in this new model. These pumps have met the standard Army 1200-hour endurance tests—under much more severe conditions than those encountered in actual service—*with no appreciable fatigue.* Hundred of hours of flight tests corroborate laboratory results—and *1100* have been ordered even before this first public announcement!

Contractors to the U. S. Government for approved aircraft accessories

AIRCRAFT PRODUCTS

Fuel Pumps
Vacuum Pumps
Hydraulic Pumps
Electrical Motor-Driven Units
Combination Pumps
Anti-Icing Pumps
Propeller Feathering Pumps
Hydraulic Motors
Primers
Accessory Drive Gear Boxes
Relief, Fuel, Hydraulic, and Check Valves
Oil Separators
Special Products Built to Customer's Specifications

PUMP ENGINEERING SERVICE CORPORATION

Specialists to the Aviation Industry

12910 TAFT AVENUE • CLEVELAND, OHIO, U. S. A.

AS OTHERS FLY IT

A Birdseye-View of Aviation Abroad

That subsidy to internal lines in Britain has finally materialized after the lines had just about given up hope. £100,000 will be doled out on the basis of 12¢ per ton mile capacity offered, with a top limit of £15,000 to any one company. This first-year rate is supposed to be whittled down every year to a final figure of 8¢ per ton mile, but there's a joker in the announcement that this whittling will be reconsidered if new equipment is put on. The rate doesn't look very impressive, but as a precedent-breaker in the old policy of refusing to consider subsidies for internal lines it's important. . . . The new Licensing Authority for internal lines began hearings on granting its first airline permits. Since they give a practical monopoly of a route, run for seven years, and are necessary to draw a subsidy, the lines all felt they had to speak now or forever hold their peace. They did a lot of speaking—everyone filed objections to everybody else's lines, and to tangle the situation up further a lot of cities sent delegations to protest because they had been passed up on the airline map. . . . The Air Ministry has turned a deal with British Airways for the first year of the London-Lisbon run. For a daily round trip by Lockheed 14s, the Air Ministry will lay out £116,000, from which will be knocked off all that British Airways takes in for mail pay, half of what other traffic brings in over estimates, and half of any saving in expenses under the estimate. If expenses run higher or income lower than figured, British Airways has to stand the loss. The contract is pretty typical of recent subsidy agreements; they all are worked out to give the Air Ministry the benefit of any breaks and not leave it holding the bag if results don't come up to estimates, while at the same time they give the airline an incentive to keep expenses down and go out after traffic. . . . With this leg of the proposed South American run in operation, survey flights will start on the Lisbon-Bathurst stretch. The report by the mission that looked over the South American section is in and is being digested.

Japan is next on the list of countries to unify their airlines. All internal and foreign lines will join up in Dai Nippon Air, for which a lot of ambitious plans are announced. One is the long-projected route to the mandated Pacific islands that has been about to start for a couple of years now. Already a considerable network of lines is operating in Manchuria and the occupied part of China, a lot of it with modern American equipment. They will link up before long with the main foreign air routes by running into occupied territory just outside Hongkong, giving the Clever Little People air connections with all the rest of the world without having to return the compliment by admitting foreign lines.

The air armament ante is still being raised. France expects to spend around eleven billion francs on her air force in 1939, against around five in 1938. Italy has come right back with a 75% increase to over two billion lire. Britain, having already upped her R.A.F. budget (AVIATION, December), is now making the first moves in reorganizing her naval aviation. The Fleet Air Arm, which has been a sort of seagoing wing of R.A.F. operating with the fleet, is to be transferred entirely to the navy by easy stages, a process that's to be completed in 1942. A call has gone out for 7,000 recruits to bring its strength up to 10,000. Four of the R.A.F.'s bases will be handed over to the navy, which will start some new ones of its own.

An Italian bomber has carried off the main speed records with useful load; there's been a lot of competition for them in recent years as they've come to be a sort of Blue Ribbon in the efforts to improve the breed of light bombers. A new model of the Savoia SM 79 with three Piaggio engines of 1,000 hp. carried 4,400 lbs. for 1,250 miles at an average speed of more than 290 mph., beating by about 20 mph. the previous record held by the French Amiot 370. With the same load over 625 miles the average was about 295 mph., compared with the mark of 280 set by an earlier model of the same ship with less power. . . . Another one for the books was the cancelling out of all the cross-Channel services due to a blizzard the day after Christmas, the first time all the lines have been weathered in for ten years—a record of some kind, if only for rashness in the dispatching offices.

The forced landing of the Cavalier at sea Jan. 21; its sudden sinking; the dramatic rescue of ten of the thirteen persons aboard it—stirred London as have few airline accidents. The fact that ice caused the trouble opened up the old battle over Imperial's apparent slowness to protect herself against that hazard. The fact that the accident occurred in Uncle Sam's front yard, so to speak, made the whole thing just that much more painful—and the debates just that much more acrimonious and complicated.

2,000 hp. engines have appeared on the ground, though neither of the ones at the Paris Show had been flown. One is a liquid cooled Hispano Suiza with 24 cylinders arranged H fashion, six to a bank. It has a lot of other things beside horsepower, such as two crankshafts and blowers, four magnetos, and twelve carburetors. The model shown had a long nose to permit mounting the engine way back in the wing (there's talk of using this on the French transatlantic boats), while another is planned for two oppositely rotating props. . . . The same rating is claimed for the new 16 cylinder Clerget Diesel, a liquid cooled V, but it's evidently very much in the experimental stage. It's not a very smooth looking job, the separate cylinders giving it the look of an antique from the days when the Liberty was the wonder of the world.

BRITAIN'S LATEST: The new all-metal de Havilland-95 "Flamingo" carries seventeen passengers in normal operations. Two Bristol Perseus XIIC sleeve-valve engines each develop 850 hp. Cruising speed is "over 200 m.p.h.".

Hepburn Plans Include 25 Air Bases; Caribbean, Pacific Raise Problems

THAT "REPORT of the special board which has already been submitted to Congress," mentioned in the President's defense message, is the recent report of the Hepburn Board on the Navy's base requirements. The President's request that Congress forthwith appropriate $44,000,000 to initiate the Board's suggestions is apt to be one of the most bitterly contested features of his program. This is not because of the funds involved but because the Boards list of new-station-to-be-built and existing-bases-to-be-improved raises some pretty fundamental problems in our defense policy.

Fifteen or sixteen of the bases are for surface vessels or submarines, these need not concern us here. Twenty-five, however, are for the direct extension of the Navy's air activity. From an international viewpoint the most significant of the suggested locations are Sitka and Kodiac, Alaska; Unalaska in the Aleutians; and Guam, Wake, Midway, Johnston, Palmyra, Canton and Rose—all Pacific Islands. Added to proposals to improve facilities in Hawaii, such air bases would vastly improve our position in the Pacific. Just how far this part of the program will get depends on how strongly Congress feels that our Pacific defenses must be pushed to a realistic perfection, no matter what it might cost us in strained relations with Tokyo. Suggestions to make Guam a strong naval and air outpost will attract the most debate. Such a move would, in effect, move our defensive frontier some 4,000 miles westward from Hawaii. It may well be that the rest of the suggested Pacific stations will be approved; decision on Guam reserved for later.

The rest of the board's list raises another question, an old one—just what is the Navy's job; what is the Army's. For the Hepburn Board also suggests enlargements of several continental U. S. stations and the enlargement or building of bases at Guantanamo, Puerto Rico, the Virgin Islands and the Canal Zone. And some of these—it seems to many observers — barge directly into the plans the Army has been shaping under the Wilcox Act for the establishment of strategic airports. The Army for example, is right this minute working on plans for a Puerto Rican airport. It is extending the runways at Albrook Field in the Canal Zone. And so on.

Will the champions of the two services thresh out the apparent duplication of effort in Congress? Washington observers think it likely. This Army-Navy scrap has been brewing up ever since the Air Corps got bombers good enough to operate more than an hour or two beyond the coastlines. It flared up when the Air Corps presumed, in last years maneuvers, to practice defense of the Atlantic Coast while the Navy was in the Pacific. It flared again last month when the Army declined to take active part in the current Caribbean maneuvers. Perhaps the Navy needs every suggested Hepburn base within the proper sphere of its functional defense assignments—but the report makes an excellent opportunity to get those assignments clearly reaffirmed. Right now at the beginning of our new defense program should be the best time to get this thing settled.

Consolidateds Do It Again

THE LONG, BRILLIANT SERVICE RECORD of the Navy's twin-engined Consolidated patrol-bombers grew brilliantly longer last month as 48 of these big boats made their way to the current "war zone" in the Caribbean.

Led by Capt. Marc A. Mitscher, the formidable four dozen, comprising PB Squadrons 7, 9, 11 and 12 from Fleet Patrol Wing No. 1 lifted off the bay at San Diego just before noon on January 10, then headed southward in what local reporters described as a 120 mile parade. Some twenty-five hours later 45 of the planes were riding quietly at Coco Solo, Canal Zone, 2,500 non-stop miles from their take-off. A few hours after that, three planes of Squadron 7 which had stopped at the Gulf of Fonseca, presumably for refueling, rejoined their fellows.

The same day the Consolidated's left San Diego for the Canal Zone, nine Sikorsky Amphibians and eight Grummans headed eastward across our southern border to join fleet forces at Guantanamo, Cuba. All in all, there seems little wrong with the mobility of our naval air arm.

Defense Program

(*Continued from page 81*)

entirely to a new aircraft program and the assumption can be made that the army and navy plan to provide for replacements and obsolescence in regular appropriations. If you must have numbers of aircraft for your score sheet, put the present army strength at 2,000 and the army goal at a total of 5,000; put present navy strength at 2,000, the navy's goal approximately at 3,000.

Note also that the recommendation for the expenditure of $44,000,000 upon new naval bases is also largely a part of the aeronautical program. The Hepburn report to which the President referred recommends the establishment of 25 new bases and the expansion of 15 existing stations. Of this total, no less than 25 are to be primarily for naval aviation. For a more detailed list see article on this page.

BOMBSIGHTS

The Moffett Memorial Trophy (for the best safety record scored during the fiscal year by an aviation unit based on a battleship or cruiser) has been awarded for 1938 to the Aviation Unit of the USS Northampton. Forty-one units were considered in the competition. No less than thirteen had records entirely free from accident. Lieut. Robert Goldthwaite is Senior Aviator aboard the Northampton.

Hoboken, N. J. got quite excited last month when a citizen living on the top floor of an apartment found a lead antenna-fish lying on a sack of coal outside his door one morning. Above it, of course, was a neat hole in the plaster ceiling and above that a n.h. in the building's roof. So far no squadron has applied for its property. If our memory serves us correctly, the Mass. National Guard once had a fish returned (in a police car) after it had fallen through five floors of an East Boston tenement and cracked the cement floor in the cellar.

Word comes from Shanghai that the Japanese have been steadily improving in bombing accuracy as their penetration of China progresses. During the early Shanghai unpleasantness, military observers on the spot marked the little brown men for Class ZZ Lousy on their attempts to hit the big Chapei North Station. Lately however they have been scoring a good percentage of hits on military objectives from as high as 12,000 ft. There's nothing like eighteen months of practice on "live targets", to brighten up one's egg-laying.

Don't make any more cracks about B-17 Flying Fortresses being "too much airplane for ordinary pilots or ordinary airports"—at least not where anyone in the Second Bombardment Group can hear you. They're tickled pink with them. In more than a year of operations, they've put their twelve Fortresses through 9,293 hours of flying without an accident; they have put them down safely on 45 very miscellaneous airports; they've pushed them through storm and clear weather, through a half dozen exercises, a trip to the Argentine, etc. At Fort Bragg, the big silver cigars barged around for hour after hour at levels above 20,000 ft. Second Bombardment says they'll do.

The A.C. News Letter has begun a glossary of slang from Randolph Field which the News Letter likes to call "the West Point of the Air" but which Flying Cadets know as "the Country Club." Samples: "Homing Device"—a furlough; "Spin In"—go to bed, or take a nap; "Raunchy"—dirty or in bad shape; "Washing Machine"—the Flight Commander's plane; "Roll up your flaps"—Shut-up, Pipe Down!

Grumman Model J2F-1 Utility Amphibians attached to the F
Air Base, Pearl Harbor, flying over the Hawaiian Islan

"WORK HORSE" OF THE NAVY AIR SERVICE—More than 100 of these GRUMMAN Utility Amphibians are serving the U. S. Navy in this country and its island possessions, performing a wide range of missions which includes mapping, photography, target towing, rescue work from carriers and shore bases, and other duties.

Versatile and rugged, it operates with equal facility from land, water, carrier deck and catapult.

GRUMMAN
AIRCRAFT ENGINEERING CORPORATION
BETHPAG
LONG ISLA
NEW YORK, U.

AVIATION'S OPERATORS CORNER

Tagging the Bases with

LES NEVILLE

C. A. A. Presents Training Program

Premature announcement of the C.A.A. pilot training program had set school operators and non-college students wondering where they fit in, and protests and petitions have been flowing fast and furiously. The air was cleared somewhat by Grant Mason's Miami speech in which he assured the operators that their ships and services would be used and established instructors who qualified would be added to the faculties of the colleges selected. But we don't quite know how veteran fixed based operators would react to having "Professor" prefixed to their names.

Way back when this plan was in the confidential, formative stage we went to Washington to discuss it and brought up the question of what it had to offer the boy who hadn't gone or couldn't go to college, because we knew a good many of them whose desire to fly was just as sincere as those who were in college. And we had the personal assurance of the C.A.A. that non-college students would be welcome under some extension arrangement if they could meet the C.A.A. requirements which are in the process of being set up.

The important point to remember, however, is that all this is experimental and no funds are available yet beyond

(*Turn to page* 98)

MIAMI SCORE SHEET

Eleventh All American Air Manoeuvres Miami, Fla.

Macfadden New York-Miami Trophy Race

Place	Pilot	Speed (mph)	Airplane
1	Constant	204.227	Beechcraft
2	Holderman	204.069	Lockheed 10
3	Bussy	186.408	P&W Beechcraft 18

Green Trophy Race (550 cu. in. displacement or less)

1	Livingston	166.169	Warner Monocoupe
2	Wittman	143.432	Cessna
3	Church	139.065	Cessna

Dominican Trophy Race (Sportsman Pilots)

1	Bunch	154.807	Warner Monocoupe
2	Arents	141.261	Beechcraft
3	Hay	126.004	

Glenn H. Curtiss Trophy Race (850 cu. in. displ. or less)

1	Livingston	156.806	Monocoupe
2	Le Vier	151.011	Beechcraft
3	Wittman	145.972	Cessna

K. K. Culver Trophy Race for Women (handicap on displ.)

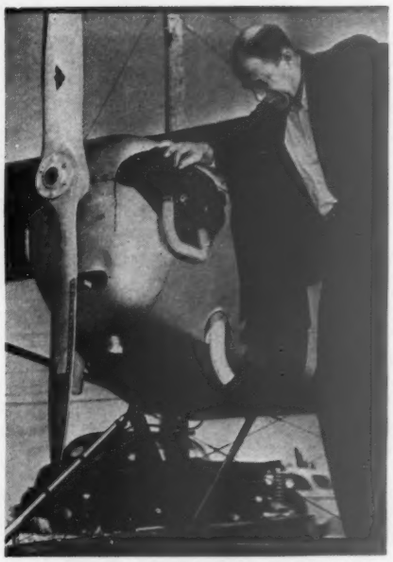
1	Edna Gardner	117.24	Monocoupe
2	Edith Descomb	142.7	Cessna
3	Bessie Owens	147.017	Beechcraft

Firestone Trophy Race (Finals)

1	Woods	95.334	Aeronca K
2	Gorski	95.103	Aeronca K
3	Muzzy	93.611	Luscombe

Freddy Lund Trophy for Aerobatics (Winner picked by crowd)

1	Burnett	Travelair
2	Pederson	



MAKES SEAPLANE RECORD: (Left) Dewey Eldred and the Lycoming Taylorcraft used in his 902 mile international record for light airplanes.

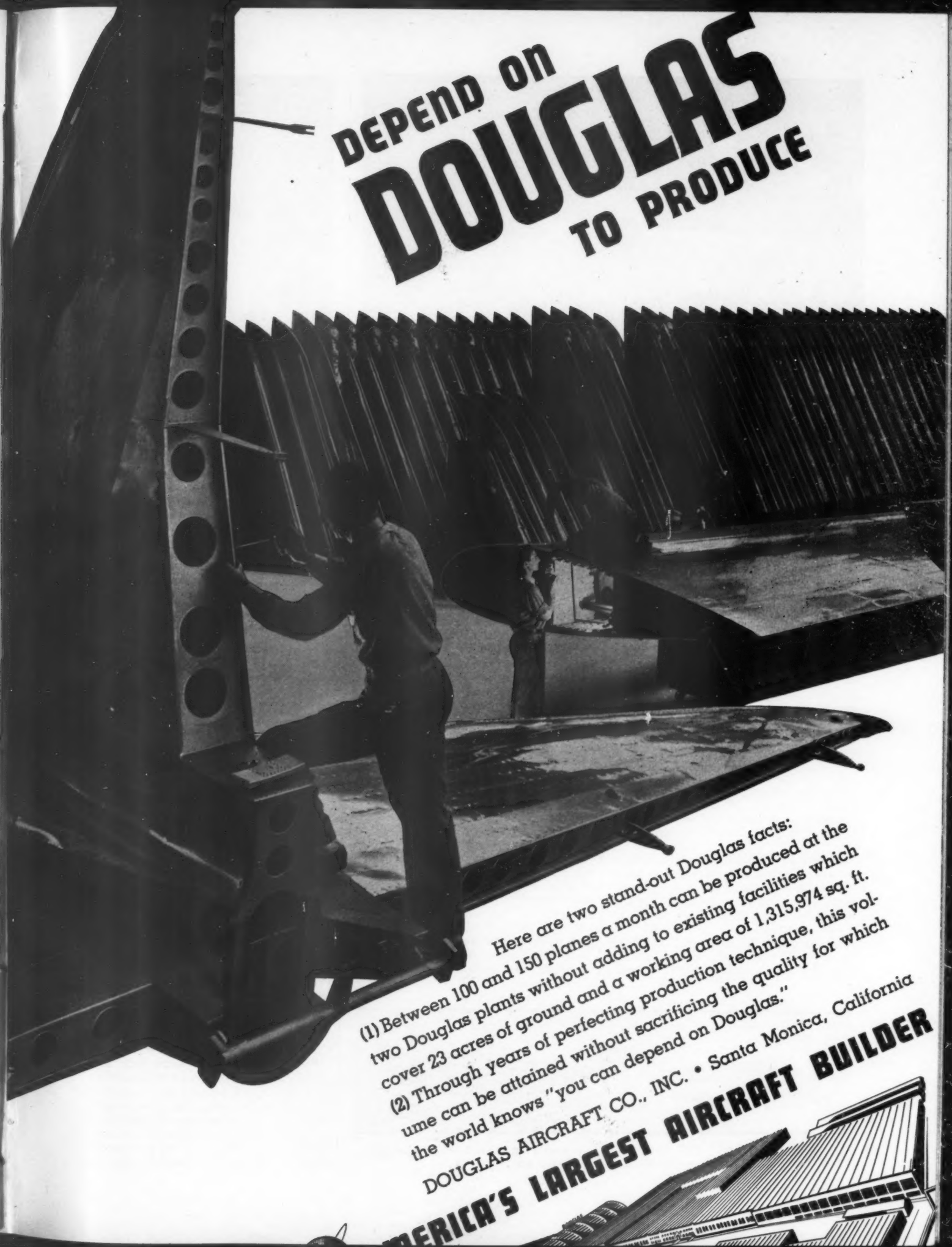
N. Y.—MIAMI WINNER: (Below) Max Constant and his Pratt & Whitney powered Beechcraft.

To Readers of Aviation's "Market Place"

THE POSITIONS VACANT classification of the January 1939 issue of AVIATION carried an advertisement received in the regular way for five pilots wanted to fly planes to San Francisco under especially attractive conditions as to future employment. The advertisement appeared with this name and address: "R. E. Luebbers, Prof. of Aeronautics, Albion College, Albion, Mich."

Albion College was besieged with inquiries and promptly advised us as follows: "Mr. Luebbers is not connected with Albion College in any manner, the College offers no instruction in aviation, and has given no consideration to the establishment of such courses. Moreover, we have consulted Mr. Luebbers and he disclaims any knowledge of the matter whatsoever."

From the above it is apparent that the advertisement was a hoax. AVIATION takes this opportunity to tender its sincere regrets to Albion College, Mr. Luebbers and to those readers who may have been inconvenienced in any way through responding to it.



DEPEND ON DOUGLAS TO PRODUCE

Here are two stand-out Douglas facts:

(1) Between 100 and 150 planes a month can be produced at the two Douglas plants without adding to existing facilities which cover 23 acres of ground and a working area of 1,315,974 sq. ft.

(2) Through years of perfecting production technique, this volume can be attained without sacrificing the quality for which the world knows "you can depend on Douglas."

DOUGLAS AIRCRAFT CO., INC. • Santa Monica, California

AMERICA'S LARGEST AIRCRAFT BUILDER

NIGHT FLIGHT PATH: During the recent Lights, Inc. demonstration at Santa Maria Airport, one West Coast editor caught the path of an airplane's lights. The upper line at the left shows the take-off, the lower line the landing. The vibrations in the take-off line indicate a semi-stall.

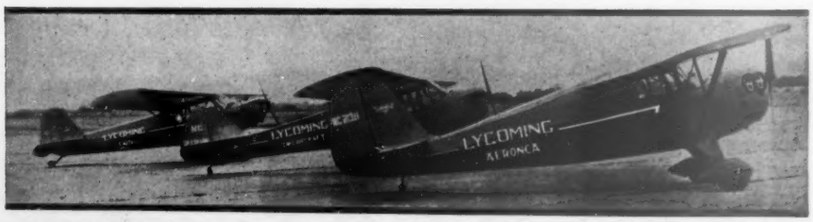
the first $100,000 grant of N.Y.A. money for test period between now and June.

In connection with the flight training program, the C.A.A. is instituting a special controlled-instruction course designed to enable all candidates to pass the private pilots' test with ease at 35 hours. The course requires 8 hours dual plus 9 hours of dual check time by the instructor and 18 hours of solo, the dual check time alternating with the solo on a ratio of 30 minutes check time to each solo hour. As an incentive for the instructors selected, they will be paid for 50 hours of instruction even if only 35 hours is needed to pass.

Guinea pig colleges, selected on the basis of their pioneer work in aeronautical engineering and flight training are: Purdue University, University of Alabama, University of Minnesota, University of Washington, Massachusetts Institute of Technology, Texas A & M College (Arlington, Tex., branch), Georgia School of Technology, New York University, University of Michigan, University of North Carolina, University of Kansas, San Jose State College, Pomona Junior College.

Troy airport will cash in on the defense program if a recent rumor is reliable. The story is that the C.A.A. will recommend advancement to a Class 2 port on or before February 1. This would involve construction of two paved runways at a cost of about $120,000, construction of a new hangar and installation of a super radio beam, of the type now being installed at airports along the major airlanes. Funds for certain of these airports have been earmarked from the $300,000,000 requested by the President for enlarging airports and seaplane bases throughout the country.

With the CAA report on airports in the offing, and some form of Federal airport assistance hoped for, announcement of the Dycer Airport Aid Plan is particularly timely. This plan, sponsored by Non-Scheduled Aviation, Inc., of Los Angeles, has been developed under the direction of E. A. Dycer, veteran operator. Under the Plan the CAA would control all allocations of Federal funds for Municipal airport assistance. Aid to commercial airports is restricted to drainage, grading, and runway surfacing improvements. Quality and character of such improvements is predicated on a three-year use expectancy and a qualifying condition is prior investment of at least $2,000 in private capital for hangar facilities. Maximum aid to a single private airport is set at $10,000. Assistance to airports holding leases of two years or less would be limited to $5,000, with provision for expansion of this amount to the full $10,000 maximum for longer lease periods. Federal funds for maintenance of surfaced runways is limited to 25 per cent annually of the total amount allotted for the original improvement. Provision is also made for Federal maintenance of commercial runways installed originally with private capital.



CONVOY LEADERS: The Lycoming Trio featuring Jim Piersol (Aeronca), Bob O'Connor (Cub), and George Levis (Taylorcraft).

HEADS LICENSED AIRMEN: C. F. McReynolds, our own West Coast Editor, is new president of the Licensed Airmen of America. Cliff Pinard is vice-president; J. D. Hull, secretary; W. G. Lengers, treasurer. New officers and retiring president P. E. Williams constitute the executive committee.

THE REPORT CARD

Of Air School Developments

New equipment has been installed at Aero Industries Technical Institute, Los Angeles, for the broader scope of master mechanics and engineering courses in which instruction commenced January 2, 1939. According to an announcement by James McKinley, school manager, enrollment is at an all-time high with more than four hundred resident students and eighteen hundred part time or correspondence students currently active. Additional work in engine repair and maintenance, carburetion, ignition, propellers, and specialized instrument study has been added to the master mechanics course, which extends over a full year and requires 2000 hours or more of active instruction.

1938 was the most active year for Curtiss-Wright Technical Institute of Aeronautics according to a report from O. D. McKenzie, Registrar. Located on Grand Central Air Terminal, Glendale, Calif., the Curtiss-Wright Technical Institute currently has more than four hundred resident students under instruction, more than at any other time in the school's many years of successful operation. This year the entire student body turned out for a "Rodeo" and barbecue on the airport given for the students by Major C. C. Moseley, president.

Marching as to War!

(*Continued from page 21*)

planes and on powered machines. From these groups the selected boys enter the air service proper after which they may go back into the flying reserve, organized and operated under RUNA auspices.

I did not run across any figures on the strength of RUNA when I was in Italy but Lydia Van Zandt, in a recent article in "U.S. Air Services," states that in April, 1936, the membership was 14,000 and today is over 120,000. Whatever the actual figure may be, it is certain that a great deal of activity is taking place under the RUNA for every airport that I visited in Italy had one or more hangars decorated with these initials.

As for factory apprentices, the most elaborate and the best organized apprentice schools that I saw in Europe, outside of Germany, were those of the Italian factories. I went through the school at Savoia-Marchetti at Sesto Calende in some detail, and also had a glimpse of similar arrangements at several of the other larger plants. Although the Savoia-Marchetti school was not physically separated from the plant proper as was the case at Oranienburg, it was operated on about the same basis as far as planning went, except that most of the boys seemed to live at home (Sesto Calende has been an aircraft manufacturing center for over twenty years and there are numbers of second generation aircraft workers available in the town), and furthermore, the more advanced apprentices seemed to be doing more actual production work for the factory than was the case in several of the German schools. Again, however, the equipment provided for the apprentice courses was of the best and the boys under training seemed to be turning out a very high quality of work.

As to what goes on in Russia, one can only guess. The propaganda picture books certainly give the impression of thousand upon thousand of enthusiastic young Russians building models, learning to fly or making parachute jumps. The only actual figures that I have ever seen were those presented in the Soviet exhibit at the Paris Show of 1936. A series of charts was on display showing progress over a three-year period of from 1933 to 1936. Looking back over my notebook, I find that a few of the figures are as follows: Parachute jumps from airplanes from 1,200 in 1933 to 20,000 in 1936; parachute clubs from 30 to 2,500 in the same period, gliding schools from 350 to 2,500; gliding pilots trained from 3,500 to 30,000. No figures were given for the number of airplane pilots trained, but the statement was made that almost ten times as many pilots were turned out in 1936 as there were in 1933. What that may mean in reality is, of course, anybody's guess.

But whatever the statistics of the Russian situation, one thing is reasonably certain. As in Germany and Italy, all the training that goes on is done at the expense of and under the immediate control of the state. Private flying, as such, is dead in the dictator countries of Europe and, seems to be on the point of disappearance in the few remaining European democracies. And, as M. Bouché pointed out in a recent editorial, the most curious thing about it is that no one is at all astonished. Under the pressure for rearmament by the totalitarian states, he sees the end of private flying in Europe and the beginning of the period of what he calls *"l'Aviation gratuit et obligatoire,"*—that is, free and obligatory.

Certain it is that France and England who have been operating for the past five or ten years on the principle that their civil aviation can insure them a nucleus of trained pilots on which they may draw in emergencies, have fallen far behind Germany and Italy in personnel training programs. Two years ago, when Pierre Cot came into the French government for the first time as Air Minister, he recognized the situation and made an effort to bolster up an obviously lagging interest in private flying by the establishment of an extensive program of what he called "l'aviation populaire." Essentially his was a plan to subsidize flight training for French youth under 21 in state-owned and state-controlled flying clubs. In addition, the A.P. was to supervise the teaching of aeronautical subjects in schools and the building of model airplanes. Membership in these clubs is entirely voluntary, and is open to everyone. A number of such clubs have actually been formed and have been operating more or less in competition with the established aero clubs throughout France, the organizations that are attempting to carry on private flying more or less as we know it over here.

In the year 1937 the Aero Club of France licensed 1,139 pilots of 20 years of age or less. The assumption can be made that most of these pilots came from the A.P. group. During that same period the Air Ministry budget to cover A.P. activities totaled some 55,000,000 francs, a fairly expensive procedure. At the same time, the aid to private aviation through existing aero clubs amounted to only 3½ million francs, and over 1,300 pilot licenses were issued to this group.

Les Ailes, as a proponent of the system of private flying as against schemes of the A.P. variety, claimed recently that if the existing aero clubs should be given a subsidy of only 5,000 francs per member trained to the point of licensing (as compared to the 50,000 francs per license under last year's A.P. activities) they could train 3,000 pilots for 15,000,000 francs total and could, at the same time, reduce substantially the cost of flying per hour. It maintained that the life of the flying clubs would be insured and that private flying in France would be put on a sound and assured basis. As with most compromise measures, the French scheme seems to be having its difficulties and as a result, there seems to be a movement toward complete centralization of some sort along the NSFK pattern, an end that can be accomplished only by the complete elimination of what little remains of French private flying.

The British seem to be heading in the same direction. For years they have been playing along with a subsidized light airplane club plan which has not produced any spectacular results, as far as mass training of pilots is concerned. Now, with an emergency expansion of its air force a necessity, to meet a sudden demand for pilots in large quantities the Air Ministry has hastily cooked up a plan, the formation of the so-called Civil Air Guard.

Whether or not the British can make the idea work remains to be seen. In essence, however, they expect to recruit (voluntarily) thousands of men and women between the ages of 18 and 50 (if they can qualify physically) and form them into units to be attached to existing flying clubs. The C.A.G.'s agree to serve their country in any required capacity (at home) in an emergency and in return are able to take flight instruction at a very nominal rate, ranging from 62½ cents per hour minimum up to $2.50 maximum, depending upon the machines used and the time during the week that they choose to fly. It is just half as expensive to fly in the middle of the week than it is over week-ends.

According to the London "By-

(*Turn to page 102*)

for STRENGTH LIGHTNESS and SAFETY IN

FUSELAGE
MOTOR-MOUNTINGS
AERIAL STRUTS
ENGINE PARTS

SPECIFY OHIO

"Ohio Special Quality non-Oxidized" Seamless Steel Aircraft Tubing is standard in round and streamline sections and available in other special shapes.

SEAMLESS TUBING

Strength, lightness and safety – that's "Ohio Special Quality Seamless Tubing".

Ohio's process of controlled atmosphere annealing and normalizing eliminates oxidized surfaces – gives a smooth bright scale-free surface – it's stronger and safer!

Aircraft parts manufacturers, engine and ship builders standardize on "Ohio" for Strength, Lightness and Safety.

The OHIO SEAMLESS TUBE CO.
OHIO SPECIAL QUALITY
Shelby, OHIO

Marching as to War!

(*Continued from page 101*)

stander" for December 21, 1938, some 5,000 C.A.G. applications had been received of which approximately half were expected to be physically qualified for pilots rating. As of early November seven organized clubs had some 550 Air Guards in actual flight training. All but two of the fifty-eight subsidized light airplane clubs in England are participating actively in the scheme.

I gathered, however, from conversations in England, that all wasn't beer and skittles with the C.A.G. The scheme had been put together hastily, and few people had much idea as to what it was all about, including many of the members. *Flight* for December 29th carried a plaintive article under the title "C.A.G. Heart-Cry—'What do they want us to do?'" It simply echoed the sort of thing I had heard. The whole show seemed badly organized so far. There weren't enough machines or instructors. The instruction varied widely from unit to unit. Not that there is anything essentially wrong with the whole idea, but that it had been put into being so hastily that too many things were still hanging in mid-air. Perhaps it has improved by this time.

The British have done rather better with their pre-air force training and have worked out the sort of thing that I think we will have to do here, and that is to farm out the first 50 hours of flight training, and the majority of the "ground school" work to the well organized and well qualified commercial flying schools. I was in civil flying schools both at DeHavilland's at Hatfield and Bristol's at Filton, and both schools were operating to capacity with cadets for the air force and members of the Volunteer Reserve, paid for, at so much a head, by the Air Ministry under contract. I was told that it would be impossible for an ordinary civilian to enter one of these schools (and there are more than 30 schools on such a basis in England today) because all the available capacity had been contracted for by the air force.

The Volunteer Reserve mentioned above is open to young men between the ages of 18 and 25 who can qualify physically for Air Force training. They do not serve full time, but most of them have civil jobs and put in their flying time over week-ends and holidays. They are given instruction on trainers and on older service types

(*Turn to page 104*)

*Reg. U. S. Patent Office

THE transparent enclosures in the Curtiss Y1-A18 are made of Plexiglas,* the acrylic sheet plastic which possesses the advantageous properties of light weight, high impact strength, excellent aging resistance, and ability to be formed into curved sections.

RÖHM & HAAS COMPANY, INC.

222 West Washington Square, PHILADELPHIA, PA.

Traffic Violators Beware!

(*Continued from page 25*)

and possibly those with lesser territories to guard, may well consider that the time has come to demand flying equipment. Immediately there springs to mind that instant advantages to be gained by swift airplane flight on enforcement missions.

Police organizations have purchased and flown airplanes in the past with considerable success. The New York state police had a plane for some time, until the experiment was ended suddenly by an unfortunate accident.

Light, fast, economical airplanes of the sport type are available today. Any well-organized police department with large territorial responsibility would consider with interest the new opportunities opened to it if such planes and a competent flying force were made available.

For example, high and responsible officials can be transported to strike areas or other explosive points within a few minutes or hours after the emergency occurs. Key witnesses can be rushed where they are needed; ballistic experts and trained autopsists, etc., can be taken to the place where their specialized knowledge is invaluable if utilized in time. Fugitives can be tracked and road patrols assisted by policemen who operate in the sky.

Equipped with ambulance fittings, the Pennsylvania plane will prove of immense humanitarian and psychological value to our men as it promises them the best of surgical care in case of injury. When an officer falls wounded by gun fire in a rural roadhouse, he can be transported by plane to one of the hospitals at Harrisburg where he will be under the care of Doctor David H. Johnston, recently appointed as Surgeon and Medical Officer of the Pennsylvania Motor Police force.

The transportation of prisoners can be facilitated with greater ease and economy.

The Police Air Unit also can render valuable service to the Highway Department by making photographs of the areas through which roads are to be constructed, thereby expediting surveys of the best routes to establish.

Types of Planes

The types of planes to be used necessarily vary somewhat with the circumstances and land conditions existing in the various states.

At present the problem is in an experimental stage, but in Pennsylvania we find a strongly built (rugged) four-or five-passenger plane, having a cruising speed of about 150 miles per hour and a cruising radius of about five hours and about 250 horsepower, to be very satisfactory.

Due to the large mountain area and also to provide a greater factor of safety for night flying, twin motored planes have been recommended. Such planes would, of course, have a larger passenger-carrying capacity. On the other hand, they would require a larger crew and would consume a much larger amount of fuel and on the whole be more expensive to operate.

Autogiro as Auxiliary

The autogiro type has also been suggested for use as an auxiliary to the standard types of monoplane. There are a number of advantageous factors which are claimed for the giro, especially the so called "wingless" type, and demonstrations of this kind of flying machine in the hands of an expert operator offer a very fascinating means of travel in the air.

Passage by the last Congress of the Dorsey Act appropriating $2,000,000 for concentrated development of the autogiro has brought hope to friends of the craft that it will soon become widely useful in civil life.

The report of the Senate Military Affairs Committee on this measure throws some light on what may be expected from the whirling-wing planes. The Committee wrote:

"As the result of tests made at the Coast Guard Air Station at Cape May, N. J., it was found that the rotary-wing aircraft possesses decided advantages in law enforcement work ashore in detecting more efficiently unlawful activities from the air and broadening the range of landing places; that it seemed ideal for aerial photography, flood-relief work, beach patrol, the accurate and safe dropping of provisions, medicines and supplies to localities marooned by floods, ice conditions or snow as well as searching for vessels or persons. Testimony on behalf of the United States Forestry Service shows this type of aircraft will have a distinct and most helpful utility if properly developed in fire-control work."

The United States Coast Guard has made the finest record of any law enforcement group in policing by air. It is noteworthy that this organization of fearless men and crack fliers is one of the few to have its own air force.

Assigned 51 airplanes and 51 pilots, the Coast Guard patrolled our national borders during 1936–7 to compile a remarkable record in checking widespread smuggling of narcotics, liquor, aliens and contraband materials of all sorts.

In this modern day of airmindedness in travel, transport of goods, and warfare, law enforcement is shirking its responsibility if it does not soon cut itself loose from its ground ties and forge for itself a new way to fight the crooks—a means which the underworld cannot copy or combat—and to render effective service in controlling auto traffic on the congested highways.

Marching as to War!

(*Continued from page 102*)

in the schools at no cost to themselves. In fact, they may draw certain small amounts to cover their out-of-pocket expenses, and are paid £25 (about $120.00) a year as a sort of retaining fee.

By and large, there seems to be more to be learned, as far as we are concerned, from the British scheme than from the others. There, at least, some effort has been made to make use of the existing commercial facilities, and to let them retain their identity without attempting to incorporate them into the fabric of the State. The British have suffered, not because their plan was bad, but because they waited until they were actually under pressure to make any sort of plan at all. Again, we have an advantage over all the rest. We not only have their experience on which to draw, but so far (and for some time to come, we hope) we are not under immediate threat to get something done,—or else. If we don't take advantage of our favorable situation and assemble all hands to work out some solution that will keep our Service personnel up to proper strength, and, at the same time develop for ourselves a private flying industry second to none in the world, then we are a lot dumber than I think we are.